NASALITY IN POLISH AND ENGLISH

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If “nasal sounds are pronounced with a lowered velum which allows the air to escape through the nose” and “nonnasal sounds are produced with a raised velum so that the air from the lungs can escape only through the mouth” (Chomsky and Halle 1968: 310) then Polish and English are clearly seen to differ considerably in the degree to which they exploit the feature [+nasal]. The most conspicuous difference consists in the phonetic inventory of nasal sounds used in the two languages. English is usually said to have three independent nasal consonants bilabial, alveolar and velar (cf.: ran-ran-rang), each with a few variants determined by the phonetic context (Gimson 1962: 188). The Polish inventory of nasal consonants contains four nasal segments: bilabial and dental, both of which can be palatalized (cf.: maly-midy, pan-pad). These consonants again have variants in various contexts. Apart from nasal consonants several nasal vowels also appear in Polish (Doroszewski 1962: 94). In addition Polish is claimed to possess nasal glides and even nasal diphthongs (Biedrzycki 1965, 1972).

The present paper will attempt to examine the phenomenon of nasality in the two languages. We shall first discuss the phonetics of nasal sounds in Polish and English, and this will be followed by a brief survey of some of the previous works on nasality in Polish. Following this we shall present a short sketch of the clusters in which nasal sounds appear. After that we shall concentrate on some phonological processes where nasal sounds are involved in an attempt to see whether and to what extent, nasality can be predicted. It will be seen that Polish and English are considerably closer in their phonological exploitation of nasality than the phonetic consideration might suggest, i.e., in spite of the vast phonetic differences, the underlying pattern with
respect to nasality shows remarkable similarities. Towards that purpose we shall adopt the view of phonology propounded by generative grammar (Chomsky and Halle 1968; Postal 1968) with one proviso: no consistent attempt will be made to capture the phonological processes by means of fully formal rules. Chomsky and Halle (1968) presented a reasonably full picture of English phonology, but our understanding of the workings of Polish phonology is very slight (Lightner 1963, Gladney 1968), and thus any attempt to formalize a limited fragment of it would be premature. In all fairness it should be added that a considerable amount of work on Polish in general and on nasality in particular has been carried out within the framework of autonomous phonemics (e.g. Biedrzycki, Jaszem, Zagórska-Brooks) and we shall comment on these works briefly as we proceed.

The phonetic facts concerning the basic nasals and the distribution of their variants will be summarized now.

The bilabial nasal [m] occurs initially, medially and finally in both languages, e.g.: mouse, snake vs. most, masto, summer, lemon vs. pomarańcz, wypomór; lamb, come vs. dom, bron. [m] in both Polish and English can sometimes be devoiced though the respective environments are different — in English after the initial [s], e.g.: smoke, smith, while in Polish in word-final position after a voiceless consonant, e.g.: pism, rym. Both languages show labio-dental variants before a following labio-dental consonant, e.g. comfort, emphasis — tramważ, enforza. In English [m] can sometimes be syllabic as in rym and bottom, a phenomenon which does not exist in Polish. On the other hand, Polish exhibits geminate nasals, e.g.: gamma vs. gama while in English this can be seen only across word boundaries, e.g.: home-made, Tom masz.

The basic variant of [n] is alveolar in English and dental in Polish. [n] can occupy word initial, medial or final position, e.g.: never, kniet — wosny, nerk; smute, wonder — strona, sinus, gone, learn — pism, krun. As in the case of [m], [n] can be partially devoiced after the initial [s] in English, e.g.: sneek, snake and after a voiceless consonant in Polish, e.g.: piosn. In English [n] can become labio-dental before a following labio-dental thus overlapping with the labio-dental [m], e.g.: infant, infernal; This phenomenon can also be observed in the Polish infominacja. The main Polish variant of [n] appears in Polish before a dental consonant, e.g.: moth, teeth, while the main English variant of [n] appears in Polish before a post-alveolar consonant, e.g.: teka, pęczek. In English there exists a post-alveolar variant of [n], e.g.: control, country, not recorded in Polish. As in the case of [m], geminates appear within words in Polish, e.g.: ranzy vs. rany, and across word boundaries in English, e.g.: ten names. Furthermore [n] can be syllabic in English, e.g.: sudden, vision.

The velar nasal [ŋ] in Polish is fully determined by the context, in that it can appear only before a velar plosive [k, g], e.g.: Kongo, tango, relka, drug

and it is furthermore subject to some dialectal variation (Klemensiewicz 1962: 37). In the dialect under description it does not appear in words like laszki, okienko, nasinerka. Details of the distribution of the velar nasal will be discussed below. Subject to the same placement as the velar nasal is the post-palatal nasal appearing in such words as strzyki, angielski. Thus the palatal variant does not appear in laszki, wamienki, suknienki etc.

The velar nasal in English is to a lesser extent determined by the phonetic context. Although it is initially impossible, it may occur medially before consonants, e.g.: England, anchor, anxiety, and before a vowel, e.g.: Birmingham. It also occurs finally, e.g.: tongue, among. Owing to its skewed distribution, the velar nasal is never geminated either in Polish or in English. It may, however, occasionally be syllabic in English, e.g.: taken.

Two palatal nasals which occur only in Polish are the bilabial nasal [ɲ] and the pre-palatal nasal [ŋ]. Neither of them can appear before the front retracted vowel [i]. Furthermore [ɲ] can occur only in word initial or medial position before a vowel, e.g.: miś, między, pomiedzy, tom vs. tomie, Niesie nie vs. Niemiec. [ɲ] can occur in all positions, e.g.: nigdy, nie, konie, batka, brata, strach. It is partially devoiced in word final position when following a voiceless consonant, e.g.: pieszki, wąpki. The palatal consonant [ɲ] is usually pronounced as a nasal semi-vowel [ɲ̃] in the pre-spirantal position (Beun 1969: 69, Wierszowska 1971: 148), e.g.: kostki, łasy, dzieciaki etc.

This terminates our survey of the phonetics of the nasal consonants in Polish and English. It has been observed that [m] and [n] occur freely in both languages while [ŋ] shows a restricted distribution. [m] and [ŋ] are specifically Polish and have no direct equivalents in English. All sounds have variants which result mostly from assimilatory phonetic processes that are in part different in the two languages. Additionally, English nasals can be syllabic before word boundaries after a consonant. In Polish [m] and [n] can occur as geminates in word medial position while in English a similar process can exist only across word boundaries.

Polish is said to possess six nasal vowels [ɔ̃ ɔ̃ ɔ̃ ɔ̃ ɔ̃ ɔ̃] (Wierszowska 1971: 136, Beun 1969: 37, Doroszewski 1962: 92). Generally speaking, nasal vowels appear, if at all, only before spirants or in word final position. The latter case is true of [ŋ] and [ŋ̃] only. There are no nasal vowels before plosives or affricates and pronunciation [b̥] or [r̥ęka] are considered to be highly artificial. But the situation is far from clear even in the pre-spirantal and final position. The traditional view that they are nasal vowels (Szczerb 1969: 10, Klemensiewicz 1962: 37) has long been observed to be inadequate. Beun (1969: 59), Jaszem (1951: 97), Doroszewski (1962: 90), Wierszowska (1971: 135) and others agree that the so-called nasal vowels are in fact of diphthongal nature, where the traditional nasal vowel is deasalized and a nasal back glide develops. Pure vowels and non-nasal diphthongs are heard in colloquial
speech but these are considered incorrect pronunciation (Wierchowska 1971: 139, 141).

A similar view is taken by Biedrzycki (1963: 35 ff) who transcribes the traditional nasal [ɛ] and [ɔ] as [ɛw] and [ɔw]. Two things should be noted about this transcription: in the first place it is not doubtful whether nasalization should be marked over both elements of the diphthong. Biedrzycki insists on marking nasalization in every case where a nasal follows a vowel, e.g.: dom [dɔm], ep [ɛpɔ], pas [pɔs] etc. While it is perhaps possible to admit that some degree of nasalization might be detected in such cases, it is still not obvious whether a phonetic transcription noting such details is anything more than an exercise in phonetic extravagance. The degree of nasalization, assuming that nasalization can be heard there, is negligible and in what follows we shall disregard it. Biedrzycki did it himself in a recent book (1972) where vowels before consonants are unmarked for nasality and it is only the glide that possesses nasality in the diphthongs, e.g.: dom [dɔm], kęs [kɛws], sq [sqɔw] etc.

Another transcription problem that requires some comment is the use of the symbol [w] to designate the back nasal glide. The difference between the last segment of sq [sqɔw] and the first of latwe [wɔstɔ] is not only the presence of nasality in the former and its absence in the latter but, above all, it is the difference between a glide and a sonorant. Biedrzycki also notes the difference although he attributes it to the absence of lip rounding in the nasal diphthong: “Die nasalen Diphthonge (...) unterscheiden sich aber von den oralen Diphthongen (...) erstens durch eine charakteristische starke Nasalität des zweiten Elements (...), zweitens dadurch, dass die Lippen beim [w] nicht gerundet werden”. (Biedrzycki 1972: 42).

The conclusion that [ɔw] and [sqɔw] differ not only by the presence of nasality in the second element of the nasal diphthong contradicts Zagórska-Brooks' experimental findings (1968). She undertook to find out by means of acoustic analysis and a listening test whether word final -q and -q₁ are homophonic in e.g.: ciągnąciągnął. Here findings indicate that this is indeed the case, i.e., that speakers of Polish pronounce words like sięgnącięgnął in the same way. Not being qualified in acoustic phonetics we have nothing to say about this part of her work. We merely wish to point out that the way the listening test was conducted vitiates the validity of the conclusions. 20 minimal pair sentences were made up and recorded by two native speakers. These sentences were played to 8 listeners who were asked to underline the subject of the sentence (either he or they). Thus there were 320 choices for each speaker. On the basis of statistic considerations it was decided that if the number of incorrect answers was 145 or more it could be concluded that the sounds were not different. The number of incorrect answers in the case of the first speaker was 152 and of the second speaker - 146 (Zagórska-Brooks 1968: 37 - 39). This led Zagórska-Brooks to the conclusion that speakers of Polish could not hear the difference between word final -q and -q₁, in other words that no such difference exists. A look at the minimal pair sentences suggests that these results must be taken with caution. Almost all minimal pairs present not only the suspected phonetic contrast but also a grammatical one, viz., that of the 3rd person plural future tense and 3rd person singular past, e.g.:

19. W południe zakręcił się koło domu. “At noon he will get busy around the house”.

20. W południe zakręcił się koło domu. “At noon they will get busy around the house”.

In a number of these sentences, the past tense would normally be expected while the future tense sounds odd, e.g.: Na wojnie zginął dzielnie. “They will die bravely in war” vs. Na wojnie zginął dzielnie “He died bravely at war”. The latter sentence is almost a stock-phrase while the former is somewhat surprising (one might expect to find it in some unusual context). Consequently it is difficult to predict, although Zagórska-Brooks presents no details, that the pronoun he was more often “heard” than they. In other words the test did not guarantee that the choice the listeners made was dictated by what they heard only and not by some extra-phonetic factors. Thus the task Zagórska-Brooks set herself, i.e. proving the homophony of word-final -q and -q₁, cannot be viewed accomplished.

As noted above, nasality, in particular in word final position, disappears in colloquial speech. This is more characteristic of [ɔw] than of [ɔw] (cf. Wierchowska 1971: 141) — thus one can safely say [idɔ] for [idɔ] while [idɔ] for [idɔ] or [idɔ] while [idɔ] for [idɔ] or [idɔ] would be considered either undistincted or dialectal.

The status of other nasal sounds, i.e. [ɛn] and [ɛ] is in some respects similar to that of [ɔ]. It should be noted in the first place that these nasal vowels appear exclusively in pre-spirantal position and exclusively in words of foreign origin. They can be pronounced either as pure vowels followed by nasal con-

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1 In cases like these, the traditional phonetic transcription is at its worst. Short of some enormous proliferation of symbols, there seems to be no possibility of recording these phonetic details involving not only different features but also degrees of their exploitation. If one decides to transcribe them as [sqw] then one has to reject the traditional transcription of e.g. French bon as [bɔn] and invent a new symbol for the vowel. This would naturally result in a new phonetic alphabet for every language.

2 A similar situation obtains in English where the last segment of low and the first in wos are clearly not identical phonetically, although some transcriptions (Chomsky and Halle 1968) do not mark the distinction.

3 The present author, in contrast to Biedrzycki, does not consider combinations of vowels with non-nasal semi-vowels to be diphthongs in Polish.
sonants, i.e. [an um iru] etc. or nasal diphthongs, i.e., [aw, uw, iw...], with the nasal consonant dropped out. Thus we get (Boni 1959:37):

\[ \text{[aN] or [aw]} \quad \text{sanza, awana, transport} \\
\text{[IN] or [iw]} \quad \text{wineszna, institucja} \\
\text{[IN] or [iw]} \quad \text{rypsztok, czysz} \\
\text{[UN] or [uw]} \quad \text{tundf, munestok, kusnet} \]

The vowels [e] and [o] with the diphthongal pronunciation coalesce with diphthongs in native words giving [aw] and [ow]

\[ \text{[eN] or [ew]} \quad \text{sensacja, benzynek} \\
\text{[oN] or [ow]} \quad \text{konflikt, konsul}. \]

Needless to say, the appearance of nasal glides is completely predictable by rule (Gladney 1968:115 ff.), that is the palatal nasal glide [i] will derive from a palatal nasal consonant [i] (Gladney's rule 12) while the back nasal glide [w] will derive basically from a dental nasal [n] (Gladney's rule 14). These may be called late phonetic rules in that they are ordered towards the end of the phonological component or, in any case, after the major phonological rules of the language have applied. To say that some rules are ordered late in the grammar means that they are added for the sake of phonetic accuracy and in no way do they affect the major phonological processes of the language, its "sound pattern." To take an example, Gladney's rule 12 will convert a palatal nasal into a palatal glide before a continuant. The existence of the glide changes very little within the phonology for although we get [i] in koński, [i] still remains in e.g. konia and we have to account for the [i—n] alternation:

koński — konia — konno
młyński — młyne — młyń.

Thus the existence of low-level rules adds a little to the complexity of the grammar without affecting its core.

Here we seem to have a good point of departure for a discussion of some general issues in phonological theory. We shall set it, not altogether appropriately, within Biedrzycki's analysis of nasality in Polish (Biedrzycki 1963). Embedding his discussion in the framework of autonomous phonemes, Biedrzycki posits four nasal phonemes for Polish /n/, /ŋ/, /ɲ/, /n/, each with a number of variants (allophones) whose distribution is determined by the phonetic context. The analysis is based on principles which today seem totally unacceptable, viz.: a) insistence on the strong version of the bi-uniqueness condition ("jeden dźwięk nie może należeć do dwóch fonem" p. 32), b) rejection of the relevance of morphological criteria to phonology ("Oczywiście nie znamierzymy kierowę się działalnością o symetrii morfologicznego kształtu języka przy podejmowaniu ostatecznej decyzji w rozstrzyganiu tego czysto fonologicznego problemu" p. 32), c) rejection of morphological boundaries in phonological analysis ("W niniejszej pracy przyjęliśmy jednak za zaszczeć, iż granica morphologiczna nie jest w języku polskim istotna dla klasyfikacji głosek według fonemów", p. 41), d) explaining arbitrariness of solutions by reference to the fact that the language is in a process of change (p. 34) (cf. on this point, Chomsky and Halle 1966:131).

To appreciate the unacceptable nature of such conditions, let us consider some facts about nasality in Polish in order to see what Biedrzycki's analysis makes of them: the nasals in the two sets of words are different in every word: ped (dental), pedzę (alveolar), pedși (palatal), rekę (velar), rekő (post-palatal), reće (alveolar).

The nasals of ped — pedzę are assigned to the phoneme /n/ (Biedrzycki's allophonic statements 6. 3. II. A. d. and 6. 3. II. B. a.), those of rekę — rekő to /ŋ/ (6. 5. IV. B. and 6. 5. IV. C.) and that of pedși to /ɲ/ (6. 4. III. A. d.). Although Biedrzycki does not say it, what is at stake here is clearly a case of assimilation, i.e., a nasal allophone assimilates to the following consonant in the place of articulation. But precisely the same thing happens on the morphological level where the nasal phoneme /ŋ/ or /ń/ assimilates to the following consonant to produce a velar and palatal nasal phonemes /ŋ/ and /ɲ/. This is again a case of assimilation to the following consonant in the place of articulation. Thus an analysis like Biedrzycki's makes it necessary to state the same regularity at least twice, or, put it in other words, makes it impossible to give one general rule for what clearly is one process. It is, among others, for reasons like this that contemporary linguistics has rejected the term "phoneme" (for a host of other reasons see Chomsky 1964, Postal 1968). Although it is at present not immediately obvious whether some intermediate level between the phonologi-
cal and phonetic ones may not prove necessary (cf. Fudge 1972), what is
definitely obvious that no such level can be meaningful if worked out on
superficial phonetic contrasts and based on principles such as bi-unicness
and invariance. In what follows we shall have nothing to say about the nasal
phonemes of Polish or English but we shall try to see what general processes
govern nasality in the two languages. We shall start by reviewing the major
types of consonantal clusters involving nasals. The survey presented below
mentions the most typical clusters and is of course not intended as a complete
study of clustering in either Polish or English.

Initial clusters consisting of two elements, one of which is a nasal, present
an array of possibilities in Polish as contrasted with the paucity of similar
clusters in English. Thus in Polish a plosive, a fricative or a liquid may be
followed or preceded by a nasal, an affricate may be followed and a semi-vowel
preceded by a nasal, e.g.: dwu, grunach, chmura, smiech, cza, lwa, klawy;
smieko, mruczeć, śmia, młodość; mnie, miejscę. Against this range of possibilities
there is basically only one cluster type in English, viz. /sk/ + a nasal, e.g.:
smoke, snake, smith. Apart from this, there is a doubtful case of two nasals and
of a nasal followed by a glide.

As is well-known, there are no initial clusters consisting of four members
in English and no nasal can appear in triple clusters (Cygan 1971: 64 ff.).
Conversely, Polish offers again a variety of possibilities, some of which can be
exemplified as follows: tymi, gromot, krawebny, cza, czmę, mgieniemia,
nglied, ngło, moczzenie, lśni, mścić etc.

The number of initial clusters would still go up if account were taken of
custers resulting from various morphological processes that add prefixes,
that is to say of clusters that contain word and morpheme boundaries, e.g.: 
drygnd, drgienie.

Final consonantal clusters appear to be quite numerous in English (Cygan
1971: 66 - 70) and a great number of them contain a nasal segment. A closer
inspection reveals, however, that a considerable part of the clusters arises
across morpheme boundaries. Thus, if it is true to say that we get a [nd]
cluster phonetically, e.g. hanged or [̄stθ], e.g. thousandths, it is equally true to
say, disregarding the inaudible word boundaries, that we get a seven member
[mpθskio] cluster medially, e.g. triumhed screaming. Once morpheme
boundaries are taken into account, the number of final consonantal clusters decreases
radically and we have basically [nd], e.g.: cud, send, [nt] e.g.: cant, ant, [ŋk],

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* This is doubtful as the phonetic semi-vowel [w] is a liquid phonologically, cf.: maly = mali.
* The cases are doubtful because mnaonic has an alternative pronunciation with a
  single nasal and this word is felt to be non-English in any case. The nasal plus glide cluster
  is suspect because it is derived from an underlying nasal followed by a vowel (Chomsky
  and Halle 1968: 192 ff).

e.g.: sink, bank, [ns], e.g.: tense, immense, [mp], e.g.: imp. lamp, [mf], e.g.:
mymph, triumph, [ni], e.g.: lurch, lurch, [ni], e.g.: plunge, strange, [ln], e.g.:
sim, film, [ln], e.g.: klim. Most of the other three or four member clusters result
mechanically through the addition of appropriate suffixes and endings. It will
furthermore be noted that the nasal is, in a number of cases, homorganic
with the following obstruent (see below). The Polish final clusters are richer in
that we get combinations of plosives, fricatives, affricates with a preceding or
following nasal, e.g.: wapok, had; pum, pygma; wiek, ksiądz, liquids and semi-
vowels plus nasals, e.g.: palm, pokarm, wym and double nasals, e.g.: hymn, very
much like in the initial position. Three or four member clusters containing
nasals are rare, e.g.: asumpt, pils, huamt, klamit, przekładek.

We may deal with the difficult problem of medial clusters very briefly by
adopting the principle developed by Cygan (1971: 111) and dividing them into
two groups: 1) clusters which conform to the initial or final type, 2) clusters
which do not appear initially or finally. Disregarding again clusters arising across
boundaries, it is easily noticeable that Polish medial clusters containing nasals
in the majority of cases conform to the initial or final type while English clusters
diverge from them by adding new ones (Cygan 1971:111: a) plosive+nasal,
e.g.: hypnotist, atmosphere, acid, technical, pigmy, signal, kidney; b)
fricative+nasal, e.g.: Daphne, etonomy; c) nasal+nasal, e.g.: gymnüsü,
unify.

Larger clusters also admit new combinations of sounds, e.g.: remonstrance,
emblem, anxious.

Turning to phonology now, we shall try to see whether and to what extent
the existence of separate nasals can be predicted on independent grounds.

Firstly, we shall assume without further justification that the scaled
nasal vowels in Polish will not appear in phonological representations but will
be derived from an underlying mid vowel + nasal in some environments (Light-
ner's rule 25) with a subsequent deletion of pre-spirant nasal consonants.
Likewise, nasal vowels in some dialects of English will be derived in a similar
manner (Chomsky 1964c: 82).

Nasal assimilation seems operative in both languages and appropriate
rules for Polish have been posited by Lightner (1963: 225) and Gladney (1968:
117) and for English by Chomsky (1965: 176), Chomsky and Halle (1968:
85, 209, 222, 234) and Cygan (1971: 96). Taking Polish as the starting point,
consider the following sets of words:

I. a. posepny, bębnić, stępac, rudać, zastępstwo
  b. rząd, kryty, poleżywia, żado, święty, piętrzyć
  c. rzący, tęca, mączka, psac, mączak
  d. pięć, lędźwico, kreci, česi, brnać
  e. ręka, wegia, pat, kregu, mięska, druga

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In e.g. *tramwaj, informacja*. The subrule restricted to words of foreign origin will account for the velar nasal when preceded by any vowel. The nasal before a velar plosive deserves some further comment. As noted above the rule of nasal assimilation accounts for the appearance of the velar nasal in *Fe, If* and *Ig*. At the same time the non-velar quality of the nasal in words like *słomka, łazienka, wronna, sonka* etc. is automatically predicted, for, it will be recalled, the nasal assimilation rule cannot operate across morpheme boundaries. We get *słomka* because of *słoma* or *bronna* because of *bronna* etc.

The English rule of nasal assimilation has been noted in several places. Chomsky's original rule (1965: 176)

\[
[+\text{nasal}] \rightarrow \left( \left[ \begin{array}{c} \text{a grave} \\ \beta \text{ compact} \end{array} \right] \right) \mid \left( \left[ \begin{array}{c} \text{a grave} \\ \gamma \text{ sharp} \end{array} \right] \right)
\]

has been shown by Cygan (1971: 96) to be inadequate as it would turn nasals before palatals into palatal nasals. Consequently Cygan suggested that the rule should be split into two:

(a) \[[+\text{nasal}] \rightarrow \left( \left[ \begin{array}{c} \text{a grave} \\ \beta \text{ compact} \end{array} \right] \right) \mid \left( \left[ \begin{array}{c} \text{a grave} \\ \gamma \text{ sharp} \end{array} \right] \right) \]

(b) \[[+\text{nasal}] \rightarrow \left( \left[ \begin{array}{c} \text{a grave} \\ \beta \text{ compact} \end{array} \right] \right) \mid \left( \left[ \begin{array}{c} \text{a grave} \\ \gamma \text{ sharp} \end{array} \right] \right) \]

where (a) would turn nasals into [m] before labials and into [n] before velars while (b) would turn nasals into [n] before dentals and palatals (Cygan 1971: 96).

Cygan's argument is obviously sound and Chomsky's rule must be modified but it still seems possible to express the generalization by means of one rule which must be appropriately complicated to reflect the fact that nasal assimilation is not of general applicability. Following a suggestion of Harris's (1970: 35) nasal assimilation in English can be expressed by imposing the "if -- then" conditions on the rule (cf. Harms 1968: 73 ff):

\[
[+\text{nasal}] \rightarrow \left( \left[ \begin{array}{c} \text{a anter} \\ \beta \text{ cor} \end{array} \right] \right) \mid \left( \left[ \begin{array}{c} \gamma \text{ anter} \\ \delta \text{ dist} \end{array} \right] \right) 
\]

Conditions: if $\beta \neq \gamma$, then $\alpha \rightarrow$$= \beta$.

This rule, while predicting the appearance of [n] before palato-alveolar obstruents, also accounts for the non-existence of certain clusters in English, namely
The condition says that if the features for anteriority and coronality in the following obstruent do not coincide, then the nasal must be anterior and it agrees in coronality with the obstruent. As all palato-alveolar obstruents in English are /-anterior, + coronal/ the nasal must be /-anterior, -coronal/, i.e., [n].

The feature /distributed/ was introduced into the rule to achieve a greater degree of phonetic detail. Without that feature the rule would make no distinction between dental and alveolar nasals (cf.: mouth, tenth vs. man, ten) as well as between bilabial and labio-dental nasals (cf.: embed, intend vs. emphasis, information).

Several inadequacies of the rule must be noted:

a) the introduction of the feature /distributed/ is suspect on theoretical grounds as it is not exploited anywhere else within the phonological rules of English. Introducing a distinctive feature with the sole purpose of accounting for some low-level phenomena is not well-motivated particularly when the phenomena seem to depend on e.g. the tempo of speech as is surely the case with labio-dental nasals in English. One might suggest that integral feature coefficients should be used instead of the feature /distributed/ particularly so as these will have to be used in any case to account for e.g., the post-alveolar nasal in country, but the final solution seems to depend on general phonetic considerations (cf. Harris 1970: 36-7). Thus we leave the rule in its present unsatisfactory shape noting that the problem needs special study which would remove arbitrary solutions.

b) nasal assimilation seems to be connected with a few other phenomena, notably stress, tempo of speech and boundaries. Chomsky and Halle (1968: 419) note that the rule of nasal assimilation must be ordered quite late or in any case after rules assigning stress. Thus, they claim, the velar nasal appears when directly following a stressed vowel, e.g.: coed, corner as opposed to concordance, congressional. But clearly the nasal assimilation rule is operative also in pre-stressed position, e.g.: consume, compel, commit, impose etc. Furthermore, examples like institute – institutional, ingrate – inappropriation show that even if nasal assimilation depends on stress this seems valid only for a case when a velar plosive is involved. But the situation is still more complicated, at least in the case of British English where some words with a velar nasal admit a variant with a non-velar nasal (cf. Jones 1997). It must be added that the variant with a velar nasal is given as predominant if stressed but this is by no means generally true (e.g. congressional has only one variant, namely with a velar nasal). It might be suggested that the appearance of the appropriate nasal depends upon the tempo of speech. Another possible solution is to preserve the regularity noted by Chomsky and Halle with the proviso that the degree of stress depends upon the tempo (one might expect that stress, in particular non-negative, tends to be weakened in rapid, unguarded speech). Thus we may conclude that a considerable amount of fluctuation between [ŋ] and [n] can be observed which seems to be connected with the existence or non-existence of rules reducing non-negative stress in different styles and tempos of speech. Consequently certain alternations between [ŋ] and [n] could be viewed as cases of free variation.

As noted above, the nasal assimilation rule in Polish may not work across word boundaries. The same holds good for English (Fudge 1970: 85) where most of the apparent exceptions to the rule are simply clusters which arise across boundaries, e.g.: films, dreamed, hanged, hangs etc. Apart from the fluctuating forms just mentioned (income, encourage) there are a few genuine exceptions, e.g.: Thames, clumsy, clumsy, James. There is one clear case, however, where the above generalization is downright false, namely the negative prefix in-, e.g.: inaccurate, inevitable, inconsistent, intolerable, inescapable, impossible, immortal, illegal, illogical, irrelevant, irreconcilable etc. It is difficult to adduce any reasonable argument for positng morpheme boundaries after the prefix; rather the rule seems operative in spite of the existing word boundaries. On the other hand (cf. Fudge 1972: 146) forms like unpopular may, but do not have to, be pronounced with either a complete or incomplete assimilation. But we would disagree with Fudge (1972: 146) in treating the two phenomena on a par. Forms like unpopular are perfectly regular in the sense that they do not undergo nasal assimilation due to the presence of the word boundary. Forms with incomplete or complete assimilation can be observed in casual or unguarded styles only, which suggests that the nasal assimilation rule would have to be modified for such styles by, say, deleting the word boundary or in some other way (cf. Harris 1969: 15 ff.). What remains unexplained is the behaviour of the prefix in-, which appears exceptional. A possible solution is the use of a minor rule in the sense of Lakoff (1971) and Lightner (1968), which would mark the prefix as an undergoing nasal assimilation in every case.

Nasal assimilation is a major phonological process that helps to predict the appearance of nasal consonants in some contexts, that is, to say, no detailed specifications of nasality are needed in the appropriate lexical representations.

11 Although it is not obvious how the “if – then” conditions should be evaluated, it still seems preferable to have one rule rather than two when closely related phenomena are involved.

12 The importance of recognizing different styles is discussed by Harris (1968: 6 ff).

13 In the case of a following liquid (inflexible, irrational) the rule does not assimilate the place of articulation only but all the other features as well. A subsequent rule of cluster simplification (Chomsky and Halle 1968: 48 ff) applies to produce the phonetic form.

14 “word” and not “morpheme” boundary as Fudge would have it.
The rules predict the occurrence of the velar nasal in Polish completely and, to a limited extent, of all other nasals in both languages. The predictability of nasality, however, is greater than that. Chomsky and Halle claim that the velar nasal in English is completely predictable from phonological representations containing an unspecified nasal followed by a velar voiced plosive, i.e. /ŋ/. The rule of nasal assimilation and another one deleting the final /ŋ/ after a nasal produce the desired result, i.e. /ŋ/. Thus [ŋ] is derived by the two rules from underlying /siNgr/. In the case of [ŋ] only the nasal assimilation rule will apply leaving the voiceless velar intact.

There are a few problems connected with the rule that must be briefly commented upon. /ŋ/ is apparently dropped after nasals in word-final position occurring in word medial position (Chomsky and Halle 1998: 85-6), e.g. bring vs. mingle from underlying /briNg/ and /miNg/. It also drops before certain affixes that carry the # boundary, e.g., -ing, -er /agentive, -ly as brining, from /briNg#iNg/, singer from /siNg#er/ vs. finger from /fiNg/, finger from /fiNg/; also singly from /siNg#ly/ and single from /siNg+Vt/ vs. singlet from /siNg+IVt/. The rule of g-deletion does not apply before the suffix -er of the comparative degree, e.g., stronger, longer, younger. The appearance of /ŋ/ in anger, longer and adjectives derived from these is an instance of the same rule, i.e. /ŋ/ does not drop in word medial position. The appropriate phonological representations for these words can be (Chomsky and Halle 1998: 86): /hunGr/, /aeNg/, /hunGr+y/, /aeNg+y/. But the underlying /Ng/ cluster, although the most common one, is not the only source of phonetic /ŋ/. According to Chomsky and Halle (1998: 234) in some words it is to be derived from an underlying nasal plus a velar continuant /x/. This is the solution offered for words like dinghy, hangar, gingham, Birmingham but its correctness depends upon the recognition of an underlying velar continuant. If the segment is rejected (cf. Huford 1970: 21), then the words would probably have to be treated as exceptions.15

The presence of palatal [n] and [ŋ] is said to constitute the major difference between the Polish and English inventory of nasals. As was noted in conjunction with the phonetics of Polish nasals, [n] cannot occur before [l], in word-final position and medially before a consonant. Polish phonetically have usually described the [n] sound as a palatal bilabial nasal followed by a pure vowel and added minimal pairs like masa-masa (Szober 1962: 13). It is also admitted that, dialectally, a glide or a dipthong may follow [n] (Doroszewski 1963: 47, Wierzebowska 1971: 182). It seems, however, that in present-day Polish the presence of a front glide after the palatal bilabial nasal is prevailing. In fact, the appearance of a glide is much more general as it follows all labial and labio-dental consonants. The glide is recognized by Biedrzycki (1963, 1972) in his works on Polish pronunciation. In this way, the palatal quality of the bilabial nasal can be seen as contingent on the palatal character of the following segment. We return to a fuller specification of that segment below. [ŋ] differs from [ŋ] in that it occurs in all positions and also before consonants. Closer inspection reveals, however, that in some contexts it is clearly predictable. One of them is the position before [l] where the nasal is invariably palatal, e.g., nikt, niegdy. Also before the adjective forming suffix -ski [-n] is excluded at the expense of [ŋ]. Hence we get frequent alternations [n] vs. [ŋ], e.g., pan-pański, Ren-reński, Napoleon-napoleoński, młyśn-młynieński etc. A simple rule palatalizing /l/ before /sk/, or most probably /sk/, would account for these alternations. The necessary palatal quality of [n] and [ŋ] before [l], the impossibility of [ŋ] and [ŋ] before [l] as well as the glide appearing after [ŋ] suggest that the palatal nasals be derived from underlying plain ones in the environment before [l]. This [ŋ] would be deleted when following [ŋ] and being followed by another vowel. It would be turned into a glide after [ŋ] before a vowel. Putting all this into informal rules we have

\[
\begin{align*}
\text{[+nasal]} & \rightarrow \text{[+high]} \\
\text{[-anter]} & \rightarrow \text{[+back]} \\
\text{V} & \rightarrow \text{O} / \text{ŋ} - \text{V} \\
\text{[-high]} & \rightarrow \text{[-back]} \\
\text{[+vocal]} & \rightarrow \text{[+nasal]} \rightarrow \text{O} / \text{ŋ} - \text{V}
\end{align*}
\]

[ŋ] would also be deleted in other positions by rules needed on independent grounds (cf. Lightner's rule 44).

A rule of nasal deletion eliminates a nasal between two consonants and before the liquids [l, w] (Schenker 1954: 475), e.g., podne - podlem - podlesy, which can be expressed as

\[
\text{[+nasal]} \rightarrow \emptyset
\]

This way of handling the palatal character of /m/ and /n/ diverges from earlier treatments (Lightner 1963; Gladney 1968) that take it to be the result of palatalizing nasals by any front vowel (Lightner's rule 17). But, as correctly observed by Gladney (1968: 112) "for every Polish word displaying a front vowel following a consonant which does not show the effects of rule 17 we must explain why the latter did not apply?". The number of words in contemporary Polish displaying [ŋ] after a nonpalatal consonant is considerable. This would

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15 In the case of British English dinghy and hangar would have to be taken out of the list anyway, as the former requires while the latter allows a velar plosive phonetically (Jones 1967).
point to the necessity of modifying rule 17 rather than modifying phonological representations of a great number of words. The attempt, made above, may again prove in need of revision within a more comprehensive treatment of Polish phonology.

We shall finally turn to a phenomenon in Polish which has no equivalent in English, viz. the vocative alternation (basically alternation in backness) in the environment before a nasal plus an obstruent. Consider the following examples: ksiąg-ksiąga, best-wszech-biblioteka, gold-goldie-goldene, skypr-skępt-setting, czel-czelcia, blad-błędny, pamięć-pamiętny etc. An attempt will be made below to show that the alternations can be predicted with a fair degree of accuracy. Our question is: under what conditions do the vocative alternations take place? The partial answer which follows has been divided into five descriptive statements.

I. If the nom., gen., dat., and accusative endings in a back vowel followed by a nasal and a homorganic voiced obstruent, then the back vowel alternates with a front one in oblique cases, e.g.: zeb, dąb, jasącz, goląb, błąk, zreż, bląk, wrząc, mąż, kraj, galąg, kiwdź, etc.

Exceptions: łąd, sąd, posąg, ogład, mowida, trąd, drug. In other words, back vowels appear in closed syllables and front in open ones. Alternations never occur otherwise, that is:

a) if a mid vowel appears before a nasal followed by a homorganic obstruent, e.g.: jav, krawec, kraj, oblej, lobelje, pąk, przecz, wąsk, bąk, brzód, bègl, pająk, będk, chęć, skręć, dwór, wstręć, jek, lek, węść; exceptions: tytoń-tytońcy, mienie-mieniecy;

b) if a mid vowel followed by a nasal and a homorganic obstruent does not appear in a steam-final syllable, e.g.: śrąb, krępeń, kłębówto;

c) in words that are synchronically foreign (Chomsky and Halle 1968: 373 ff.), e.g.: anons, lament, inteligent, sens, agent.

II. In diminutives formed by the suffixes -ek, -ka, -ko the stem-final vowel is invariably back no matter what the stem-final vowel the basic form may contain, e.g.: kiesz-box, gęs-gaska, cześ-częstka, chrześ-chrzestka, przeda-przeda, rekła-rekła, dąb-dąbek, goląb-golągka, laka-lągka, strąk-strączek also in a large group of nouns denoting small animals that end in -em in the nom. sg., e.g.: będk-będką, kość-kościał, odrę-odrętka. Likewise: cieć, jąpeć, kurcę, szczętnie, żebre, orłe, piszke, proś, armię etc. The same is true about certain numbers of nouns where the stem-final vowel is added although the nouns need not be diminutives in the normal sense, e.g.: pamięć-pamiętny, dzielew-dzlętko, dziesięć-dziesiętko, pić-piątka, święty-świętk, kaw-wąkula or where the diminutive is the only form in existence, e.g. wrząc,

Exceptions: dek, piękna.

III. Before the adjectival suffix -ny the stem-final vowel almost invariably is front if followed by a nasal and a homorganic obstruent, no matter what vowel appears in the basic form, e.g.: blad-błędny, majęć-majętny, maciś-maciętny, mąż-mężczyzny, żab-żabieny, pojaz-pojeźdný, rażą-rodzący, ogład-ogładny, reką-reknięty, pamięć-pamiętny, wąsk-wątny, płcię-plciętny, nasza-nasieni, rycza-rycaty, tkwiąc-zakwinty, and vacuously doszczętny, dochy, namień, reżyw, pięć, szczęść, wiedzieć, odręcza, poświęć, teściów etc.

Exceptions are very infrequent; the following almost exhaust the list: łącza, zdąży, porządko, nierządy, przędzaly, rozwędz.

IV. Feminine and neuter nouns that end in a vowel in the nom. sg. change the stem-final front vowel followed by a nasal and a homorganic obstruent, into back when it appears in a closed syllable, i.e. in gen. pl., e.g.: święto-święć, jąpeć-jaźń, wsze-wszeń, rekła-mak, rekę-ryć, niemowidza-niemowień, dziesiętko-dziesiętka etc.

Exceptions: pęta-pet, pięta-pięt.

V. In verbs, the stem-final back vowel followed by a nasal and the infinitival ending -a alternates with a front vowel in passive participles in -ty and in nouns derived from these verbs. The front and back vowels appear, as above, in open and closed syllables, e.g.: mająć-mająć, pojaz-pojeźdr, ciść-cięci, wykleć-wykleć, tkwiąć-tkwiąć, porząć-porządno, posieć-posiadać, ogarnąć-ogarnięć.

It must be noted that in some cases the application of a specific rule seems to depend on semantic features, i.e. it is phonologically unpredictable, e.g.: pękać-peaker “bunch” vs. pęka-pszeck “bod”, rażą-rodzący “government” vs. rażą-rodzą “row”, rek-secemek “knot” vs. secemek “filter”, wieć-wieży “elm” vs. wieży “bonds”.

The above survey of the vocative alternations in the environment before nasals is anything but complete. A detailed analysis of the problem would require a separate study set within other rules of Polish phonology that are not available at the moment. The purpose of the survey was to single out some recalltrain problems and to show that what may seem erratic at first glance is in fact quite regular.

We started our comparison of nasality in Polish and English by noting that the two languages differ considerably in the degree to which they exploit the feature [+nasal]. The analysis has shown that phonological representations in the two languages make use of the same nasal segments: /m/ and /n/ sometimes not even fully specified, i.e. /N/. The only differences in underlying representations consist in the possibilities of clustering nasals with other segments. The considerable surface discrepancies between nasality in Polish and in English rest then with the phonological rules and the feature inter-
pretation rules operative in the two languages. The rules, although sometimes similar in parts, work largely differently. It is this different working of phonological rules that brings heterogeneity into otherwise similar patterns.

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