

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.: *ram-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.: *mały-miały*, *pan-pań*). 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, Jassem, 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, make* — *most, masło; summer, lemon* — *pomarańcza, wymowa; lamb, come* — *dom, brom*. [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, rytm*. Both languages show labio-dental variants before a following labio-dental consonant, e.g. *comfort, emphasis* — *tramwaj, emfaza*. In English [m] can sometimes be syllabic as in *rythm* 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 must*.

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, knit* — *nosowy, nerka; innate, wonder* — *struna, sinus; gone, learn* — *plon, kran*. As in the case of [m], [n] can be partially devoiced after the initial [s] in English, e.g.: *sneak, snake* and after a voiceless consonant in Polish, e.g.: *piosnka*. 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 *informacja*. The main Polish variant of [n] appears in English before a dental consonant, e.g.: *month, tenth*, while the main English variant of [n] appears in Polish before a post-alveolar consonant, e.g.: *teczka, pączek*. 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.: *ranny* 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, ręka, drag*

and it is furthermore subject to some dialectal variation (Klemensiewicz 1962 : 37). In the dialect under description it does not appear in words like *łazienka, okienko, wanienska*. 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 *strąki, węgiel*. Thus the palatal variant does not appear in *łazienki, wanienki, sukienki* etc.

The velar nasal in English is to a lesser extent determined by the phonetic context. Although it is impossible initially, 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 [m̥] and the pre-palatal nasal [ɲ]. Neither of them can appear before the front retracted vowel [ɨ]. Furthermore [m̥] can occur only in word initial or medial position before a vowel, e.g.: *miał, miotła, pomiot, wymię, łom* vs. *łomie, Niemiec* vs. *Niemca*. [ɲ] can occur in all positions, e.g.: *nigdy, nieść, konie, bańka, krtuń, skroń*. It is partially devoiced in word final position when following a voiceless consonant, e.g.: *pieśń, wapń*. The palatal consonant [ɲ] is usually pronounced as a nasal semi-vowel [j̃] in the pre-spirantal position (Benni 1959 : 50, Wierzchowska 1971 : 145), e.g.: *koński, tańszy, chiński* 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. [m̥] and [ɲ] 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 [õ ẽ ǣ ĩ ı̃ ũ] (Wierzchowska 1971 : 136, Benni 1959 : 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 [õ] and [ẽ] only. There are no nasal vowels before plosives or affricates and pronunciations [l̃ɛk] or [r̃ɔčka] 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 (Szober 1969 : 10, Klemensiewicz 1962 : 37) has long been observed to be inadequate. Benni (1959 : 36), Jassem (1951 : 97), Doroszewski (1962 : 90), Wierzchowska (1971 : 135) and others agree that the so-called nasal vowels are in fact of diphthongal nature, where the traditional nasal vowel is denasalized and a nasal back glide develops. Pure vowels and non-nasal diphthongs are heard in colloquial

speech but these are considered incorrect pronunciation (Wierzchowska 1971: 139, 141).

A similar view is taken by Biedrzycki (1963: 35 ff) who transcribes the traditional nasal [ɛ̃] and [ɔ̃] as [ɛ̃w̃] and [ɔ̃w̃]. 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 nasalisation in every case where a nasal follows a vowel, e.g.: *dom* [dɔ̃m], *sep* [sɛ̃mp], *pan* [pãn] 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 extravagance¹. 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], *kes* [kɛw̃s], *sq* [sɔw̃] etc.

Another transcription problem that requires some comment is the use of the symbol [w̃] to designate the back nasal glide. The difference between the last segment of *sq* [sɔw̃] and the first of *latwo* [watfo] 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 sonorant². Biedrzycki also notes the difference although he ascribes 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 [w̃] nicht gerundet werden". (Biedrzycki 1972: 42)³.

The conclusion that [ɔw] and [ɔw̃] 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 *-q̃* are homo-

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 fine phonetic details involving not only different features but also degrees of their exploitation. If one decides to transcribe *dom* as [dɔ̃m] then one has to reject the traditional transcription of e.g. French *bon* as [bɔ̃] and invent a new symbol for the vowel. This would naturally result in a new phonetic alphabet for every language.

It should be added that most of the standard textbooks of Polish phonetics do not mark nasalization in such cases (but cf. Benni 1959: 58-9).

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

³ The present author, in contradistinction to Biedrzycki, does not consider combinations of vowels with non-nasal semivowels to be diphthongs in Polish.

phonous in e.g.: *ciagną* — *ciagnął*. Here findings indicate that this is indeed the case, i.e., that speakers of Polish pronounce words like *szepną* — *szepnął* 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 *-q̃*, 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 zakrzętną się koło domu.* "At noon they will get busy around the house".
20. *W południe zakrzętnął się koło domu.* "At noon he got 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 zginą 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 not 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 *-q̃*, cannot be viewed accomplished.

As noted above, nasality, in particular in word final position, disappears in colloquial speech. This is more characteristic of [ɛ̃w] than of [ɔ̃w] (cf. Wierzchowska 1971: 141) — thus one can safely say [idɛ] for [idɛ̃] or [idɛw̃] while [idɔ] for [idɔ̃] or [idɔw̃] would be considered either uneducated or dialectal.

The status of other nasal sounds, i.e. [ã ã̃ ĩ ĩ̃] is in some respects similar to that of [ɔ̃ ɛ̃]. 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-

sonants, i.e. [an um im] etc. or as nasal diphthongs, i.e., [a[~]w, u[~]w, i[~]w...] with the nasal consonant dropped out. Thus we get (Benni 1959 : 37):

| | | | |
|------|----|--------------------|---------------------------------|
| [aN] | or | [a [~] w] | <i>szansa, awans, transport</i> |
| [iN] | or | [i [~] w] | <i>winszować, instytut</i> |
| [iN] | or | [i [~] w] | <i>rynszok, czynsz</i> |
| [uN] | or | [u [~] w] | <i>triumf, munsztuk, kunszt</i> |

The vowels [ɛ] and [ɔ] with the diphthongal pronunciation coalesce with diphthongs in native words giving [ɛ[~]w] and [ɔ[~]w]

| | | | |
|------|----|--------------------|--------------------------|
| [ɛN] | or | [ɛ [~] w] | <i>sensacja, benzyna</i> |
| [ɔN] | or | [ɔ [~] w] | <i>konflikt, konsul,</i> |

Needless to say, the appearance of nasal glides is completely predictable by rule (Gladney 1968 : 115 ff), that is the palatal nasal glide [j̃] will derive from a palatal nasal consonant [ɲ] (Gladney's rule 12) while the back nasal glide [w̃] 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 continuant⁴. The existence of the glide changes very little within the phonology for although we get [j̃] in *koński*, [ɲ] still remains in e.g. *konia* and we have to account for the [ɲ—n] alternation:

| | | | | |
|----------------|---|---------------|---|--------------|
| <i>koński</i> | — | <i>konia</i> | — | <i>konno</i> |
| <i>młyński</i> | — | <i>młynie</i> | — | <i>młyn.</i> |

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 inappropriately, within Biedrzycki's analysis of nasality in Polish (Biedrzycki 1963). Embedding his discussion in the framework of autonomous phonemics, Biedrzycki posits four nasal phonemes for Polish /m/, /n/, /p/, /ŋ/ 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

⁴ The rule is of interest in itself, as it involves the change of the feature /conson/, i.e. one which is very high in feature hierarchy.

unacceptable, viz.: a) insistence on the strong version of the bi-uniqueness condition („jeden dźwięk nie może należeć do dwóch fonemów” p. 32), b) rejection of the relevance of morphological criteria to phonology („Oczywiście nie zamierzamy kierować się dbałością o symetrię morfologicznego kształtu języka przy podejmowaniu ostatecznej decyzji w rozstrzygnięciu tego czysto fonologicznego problemu” p. 32)⁵, c) rejection of morphological boundaries in phonological analysis („W niniejszej pracy przyjęliśmy jednak za Jassemem, iż granica morfologiczna nie jest w języku polskim istotna dla klasyfikacji głosek według fonemów”, p. 41)⁶, 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 1965:131).

To appreciate the unacceptability 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), *pedzi* (palatal), *ręka* (velar), *ręki* (post-palatal), *ręce* (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 *ręka* — *ręki* to /ŋ/ (6. 5. IV. B. and 6. 5. IV. C.) and that of *pedzi* to /p/ (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 /n/ of *ręce*, *ped* assimilates to the following consonant to produce a velar and palatal nasal phonemes /ŋ/ and /p/. 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, to put it in other words, makes it impossible to give one general rule for what clearly is one process⁷. 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-

⁵ It is interesting to observe that as long ago as 1953 Panov (1970) brilliantly defended the necessity of recognizing the morphological criterion, albeit to a limited extent, in any phonological work. The arguments Panov used provide enough evidence to show that no phonology is possible without constant reference to morphology.

⁶ This is not carried out consistently. Biedrzycki refers to syllable boundaries in order to account for the longer variant of [m] in *mam je* as opposed to *mamie*. Were he fully consistent, he would have to posit yet another nasal phoneme, viz. /m:/. Likewise Biedrzycki never says what he finds objectionable about the minimal pair *rany* — *ranny* which, if taken seriously, would point to one more nasal phoneme, viz. /n:/.

⁷ The present author claims no originality as the above discussion parallels closely Halle's celebrated argument showing the linguistic irrelevance of the term "phoneme". See also Harris (1969: 14).

cal and phonetic ones may not prove necessary (cf. Fudge 1972), what is definitely obvious is that no such level can be meaningful if worked out on superficial phonetic contrasts and based on principles such as bi-uniqueness 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.: *dno, gmach; chmura, śnieg; mchu, msza; lnu, lniany; mleko, mruczeć; ćma, młodość⁸; mnie, mnogość*. Against this range of possibilities there is basically only one cluster type in English, viz. /s/+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 glide⁹.

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: *tknąć, grzmot, krnąbrny, sknera, czknąć, mgnienie, mglisty, mgła, mszczenie, lśnić, mścić* etc.

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

Final consonantal clusters appear to be quite numerous in English (Cygan 1971: 86 - 87) 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 [ŋd] cluster phonetically, e.g. *hanged* or [ntθs], e.g. *thousandths*, it is equally true to say, disregarding the inaudible word boundaries, that we get a seven member [mpftskr] cluster medially, e.g. *triumphed screaming*. Once morpheme boundaries are taken into account, the number of final consonantal clusters decreases radically and we have basically [nd], e.g.: *end, sand*, [nt] e.g.: *cant, ant*, [ŋk],

⁸ This is doubtful as the phonetic semivowel [w] is a liquid phonologically, cf.: *mały — mali*.

⁹ The cases are doubtful because *mnemonic* 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.: *nymph, triumph*, [nč], e.g.: *lunch, hunch*, [n], e.g.: *plunge, strange*, [lm], e.g.: *elm, film*, [lu], e.g. *kiln*. 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.: *wapń, hańb; pasm, gzymś; wiedźm, ksiądz*, liquids and semi-vowels plus nasals, e.g.: *palm, pokarm, ujm* 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, piłśń, kunszt, kłamstw, przekleństw*.

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, acme, technical, pigmy, signal, kidney*; b) fricative+nasal, e.g.: *Daphne, ethnography*; c) nasal+nasal, e.g.: *gymnasium, enmity*.

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 so-called nasal vowels in Polish will not appear in phonological representations but will be derived from an underlying mid vowel+nasal in some environments (Lightner's rule 25) with a subsequent deletion of pre-spirantal nasal consonants. Likewise, nasal vowels in some dialects of English will be derived in a similar manner (Chomsky 1964: 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, stapać, rąbać, zastępstwo*
- b. *rząd, kręty, połędwica, żądło, święty, piętrzyć*
- c. *ręczny, tęcza, maczka, pączek, sączek*
- d. *pięć, leźwie, kręci, chęć, brnąć*
- e. *ręka, węgla, pak, kręgu, miękka, droga*

f. *ręki, węgiel, dragi, miękki, kregi*

g. *bank, Ankara, tango, hungarystyka, angina*

II. *pogaństwo, mknąć, zamsz, zemsta, gzyms, hańba, chamski, mdlić, omdlały, mgła, mścić, branka, mrzonka, okienko, studzienka, sukienka.*

All words in group I exhibit nasal assimilation and this is not true of the group II words. Lightner's rule of assimilation reads:

$$[+nasal] \rightarrow \begin{bmatrix} \alpha \text{ grave} \\ \beta \text{ comp} \\ \gamma \text{ sharp} \end{bmatrix} \text{ in env. } \begin{bmatrix} +\text{obstr} \\ \alpha \text{ grave} \\ \beta \text{ comp} \\ \gamma \text{ sharp} \end{bmatrix}$$

Gladney's rule is slightly different:

$$[+nasal] \rightarrow \begin{bmatrix} \alpha \text{ comp} \\ \beta \text{ grave} \end{bmatrix} / \text{---} + \begin{bmatrix} -\text{voc} \\ +\text{cons} \\ \alpha \text{ comp} \\ \beta \text{ grave} \\ -\text{cont} \end{bmatrix}$$

In view of the examples given above both rules are seen to be inadequate for they would either assimilate the clusters in group II or, if the presence of morpheme boundary in Gladney's rule were insisted upon, they would fail in a number of cases in group I words. The rules might be saved, perhaps, if we were to claim that the environments are met at the point in the derivation where the rule applies. Such a claim, although probably true in some cases, would lead to a number of representations motivated solely by their applicability to the rule. Instead of pursuing this line, we propose a different rule of nasal assimilation for Polish, viz.:

$$[+nasal] \rightarrow \begin{bmatrix} \alpha \text{ coron} \\ \beta \text{ anter} \\ \gamma \text{ distr} \\ \delta \text{ back} \end{bmatrix} / \left\{ \begin{bmatrix} V \\ -\text{high} \\ -\text{low} \\ [+foreign] \end{bmatrix} \text{---} \right. \begin{bmatrix} \alpha \text{ coron} \\ \beta \text{ anter} \\ \gamma \text{ distr} \\ \delta \text{ back} \\ -\text{contin} \end{bmatrix}$$

Condition: does not apply across morpheme boundaries

This rule, while assimilating nasals in group I, will not affect them in group II. What cases like *zemsta, zemścić* show (cf.: *mścić, pomścić*) is that the rule cannot work across morpheme boundaries /pronunciations/ [zēsta] or [zēwsta] are quite impossible. The feature /distributed/ accounts for the alveolar nasals in Ic, the post-palatal nasal in If¹⁰, as well as the labio-dental quality of the nasal

¹⁰ We thus take the difference between the velar nasal and the postpalatal nasal to consist in that the former is /-distrib/ while the latter is /+distrib/.

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 Ic, If and Ig. At the same time the non-velar quality of the nasal in words like *słomka, lazienka, wronka, żonka* etc. is automatically predicted, for, it will be recalled, the nasal assimilation rule cannot operate across morpheme boundaries. We get *słomka* because of *słoma*, *wronka* because of *wrona* etc.

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

$$[+nasal] \rightarrow \begin{bmatrix} \alpha \text{ grave} \\ \beta \text{ compact} \end{bmatrix} / \text{---} \begin{bmatrix} +\text{consonantal} \\ \alpha \text{ grave} \\ \beta \text{ compact} \end{bmatrix}$$

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:

$$\begin{aligned} \text{(a)} \quad [+nasal] &\rightarrow \begin{bmatrix} +\text{grave} \\ \alpha \text{ compact} \end{bmatrix} / \text{---} \begin{bmatrix} +\text{consonantal} \\ +\text{grave} \\ \alpha \text{ compact} \end{bmatrix} \\ \text{(b)} \quad [+nasal] &\rightarrow \begin{bmatrix} -\text{grave} \\ -\text{compact} \end{bmatrix} / \text{---} \begin{bmatrix} +\text{consonantal} \\ -\text{grave} \end{bmatrix} \end{aligned}$$

where (a) would turn nasals into [m] before labials and into [ŋ] 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):

$$[+nasal] \rightarrow \begin{bmatrix} \alpha \text{ anter} \\ \delta \text{ distrib} \\ \beta \text{ coron} \end{bmatrix} / \text{---} \begin{bmatrix} \gamma \text{ anter} \\ \delta \text{ distrib} \\ \beta \text{ coron} \end{bmatrix}$$

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

This rule, while predicting the appearance of [n] before palato-alveolar obstruents, also accounts for the non-existence of certain clusters in English, namely

[mč, nǃ, mš, mž, ɲč, ɲǃ, ɲš, ɲž]. 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 /-anter, +coron/ the nasal must be /+anter, -coron/, i.e. [n].¹¹ 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.: *month, 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.: *concord, congress* 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, impregnate — impregnation* 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 1967). 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

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.

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-primary, tends to be weakened in rapid, unguarded speech). Thus we may conclude that a considerable amount of fluctuation between [ɲ] and [n] can be observed which seems to be connected with the existence or non-existence of rules reducing non-primary stress in different styles and tempos of speech¹². Consequently certain alternations between [ɲ] 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, bangs* etc. Apart from the fluctuating forms just mentioned (*income, encourage*) there are a few genuine exceptions, e.g.: *Thames, clumsy, flimsy, James*. There is one clear case, however, where the above generalization is downright false, namely the negative prefix *in-*, e.g.: *inaccurate, inevitable, inobservant, inconsistent, intolerable, insincere, impossible, immortal, illegal, illogical, irrelevant, irreconizable* etc. It is difficult to adduce any reasonable argument for positing morpheme boundaries after the prefix; rather the rule seems operative in spite of the existing word boundaries.¹³ 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.¹⁴ 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 *in-* as 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.

¹² The importance of recognizing different styles is discussed by Harris (1969: 6 ff).

¹³ In the case of a following liquid (*illegible, 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: 46 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. /Ng/. The rule of nasal assimilation and another one deleting the final /g/ after a nasal produce the desired result, i.e. [ŋ]. Thus [siŋ] is derived by the two rules from underlying /siNg/. In the case of [siŋk] 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. /g/ is apparently dropped after nasals in word-final position remaining in word medial position (Chomsky and Halle 1968 : 85 - 6), e.g. *bring* vs. *mingle* from underlying /briNg/ and /miNgl/. It also drops before certain affixes that carry the # boundary, e.g.: *-ing*, *-er* [agentive], *-ly* as *bringing*, from /briNg#iNg/, *singer* from /siNg#er/ vs. *linger* from /liNgr/, *finger* from /fiNgr/; also *singly* from /siNgl#ly/ and *singlet* from /siNg#IVt/ vs. *kinglet* from /kiNg#IVt/. The rule of g-deletion does not apply before the affix *-er* of the comparative degree, e.g.: *stronger*, *longer*, *younger*. The appearance of [ŋg] in *anger*, *hunger* and adjectives derived from these is an instance of the same rule, i.e. /g/ does not drop in word medial position. The appropriate phonological representations for these words can be (Chomsky and Halle 1968 : 86): /huNgr/, /æNgr/, /huNgr+y/, /æNgr+y/. But the underlying /Ng/ cluster, although the most common one, is not the only source of phonetic [ŋ]. According to Chomsky and Halle (1968 : 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. Hurford 1970 : 21), then the words would probably have to be treated as exceptions¹⁵.

The presence of palatal [ń] and [ɲ] 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, [ń] cannot occur before [i], in word-final position and medially before a consonant. Polish phoneticians have usually described the [ń] sound as a palatal bilabial nasal followed by a pure vowel and adduced minimal pairs like *mara-miara* (Szober 1962 : 13). It is also admitted that, dialectally, a glide or a diphthong may follow [ń] (Doroszewski 1963 : 47, Wierzchowska 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. [ń] differs from [ɲ] 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 [i] where the nasal is invariably palatal, e.g.: *nikt*, *nigdy*. Also before the adjective forming suffix *-sk-* [n] is excluded at the expense of [ń]. Hence we get frequent alternations [n-ń], e.g.: *pan-pański*, *Ren-reński*, *Napoleon-napoleoński*, *młyn-młyński* etc. A simple rule palatalizing /n/ before /sk/, or most probably /isk/, would account for these alternations. The necessary palatal quality of [m] and [n] before [i], the impossibility of [ɲ] and [ń] before [i] as well as the glide appearing after [ń] suggest that the palatal nasals be derived from underlying plain ones in the environment before /i/. This /i/ would be deleted when following [ń] and being followed by another vowel. It would be turned into a glide after [ń] before a vowel. Putting all this into informal rules we have

$$\left[\begin{array}{l} +\text{nasal} \\ +\text{anter} \end{array} \right] \rightarrow \left[\begin{array}{l} +\text{high} \\ -\text{back} \end{array} \right] / \text{---} \left[\begin{array}{l} \text{V} \\ +\text{high} \\ -\text{back} \end{array} \right]$$

$$\left[\begin{array}{l} \text{V} \\ +\text{high} \\ -\text{back} \end{array} \right] \rightarrow \left\{ \begin{array}{l} \emptyset / \text{ń} - \text{V} \\ [-\text{vocal}] / \text{ń} - \text{V} \end{array} \right.$$

/i/ 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 : 473), e.g.: *padnę* — *padłem* — *padłszy*, which can be expressed as

$$[+\text{nasal}] \rightarrow \emptyset \left\{ \begin{array}{l} \text{C-C} \\ - \left\{ \begin{array}{l} \text{l} \\ \text{t} \end{array} \right. \end{array} \right.$$

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 [ń] after a nonpalatal consonant is considerable. This would

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 vocalic alternations (basically alternations in backness) in the environment before a nasal plus an obstruent. Consider the following examples: *kląć-klął-klęła*; *kęs-kęsek-zakąska*; *gołąb-golebie-gołąbek*; *stąpać-wstępny*; *część-cząstka*; *błąd-błądny*; *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 vocalic alternations take place? The partial answer which follows has been divided into five descriptive statements.

I. If the nom. sg. mas. nouns end 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.: *zab, dąb, jastrząb, gołąb, kłab, zrab, błąd, urząd, mąż, krag, gałąź, ksiądz*, etc.

Exceptions: *ład, sąd, posąg, ogląd, mosiądz, trąd, drag*. 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.: *pęd, krawędź, kreg, oręż, obłęd, labędź; pąk, przekąs, strąk, wąs, bąk, brzdąc, kąk, kabłak, pajak; brzek, chęć, skręt, dźwięk, wstręt, jęk, lęk, wstęp*; exceptions: *tysiąc-tysięcy, miesiąc-miesiący*;

b) if a mid vowel followed by a nasal and a homorganic obstruent does not appear in stem-final syllable, e.g.: *bękart, krążownik, kłębowisko*;

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 vowel the basic form may contain, e.g.: *kęs-kęsek, gęs-gęska, część-cząstka, chrzęść-chrząstka, grzęda-grządka, ręka-rączka, dąb-dąbek, gałąź-gałązka, ląka-lączka, strąk-strączek* also in a large group of nouns denoting small animals that end in *-ę* in the nom. sg., e.g.: *bydlę-bydlątko, kocię-kociątko, ośle-oślątko*. Likewise: *cielę, jagnię, kurczę, szczenię, źrebię, orlę, pisklę, prosię, sarnię* etc. The same is true about a certain number of nouns where the suffixes are added although the nouns need not be diminutives in the normal sense, e.g.: *pamięć-pamiętka, dziewięć-dziewiątka, dziesięć-dziesiątka, pięć-piętka, święty-świętęk, kęs-zakąska* or where the diminutive is the only form in existence, e.g. *wrzątek*.

Exceptions: *dętka, piętka*.

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.: *błąd-błądny, majątek-majątny, mącić-mętny, mąż-mężny, miesiąc-miesięczny, ząb-nazębny, pojąć-pojętny, rząd-podrzędny, ogląd-ogłędny, ręka-ręczny, pamięć-pamiętny, wstąpić-wstępny, pieniądz-pięniężny*, and vacuously *doszczętny, chętny, namiętny, nędzny, piękny, szczęśny, wdzięczny, obojętny, potężny, tęskny* etc.

Exceptions are very infrequent; the following almost exhaust the list: *łączny, żądny, porządny, nierządny, przesądny, rozsądny*.

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-święt, jagnięta-jagniąt, wstęga-wstąg, męka-mąk, ręka-rąk, niemowlęta-niemowląt, dziewczęta-dziewcząt* etc.

Exceptions: *pęta-pęt, pięta-pięt*.

V. In verbs, the stem-final back vowel followed by a nasal and the infinitival ending *-ć* 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.: *najać-najęty-najęcie, pojać-pojęty-pojęcie, ciąć-cięty-cięcie, wykląć-wyklety-wyklecie, tknąć-tknięty-tknięcie, począć-poczęty-poczęcie, ogarnąć-ogarnięty-ogarnięcie*.

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.: *pęk-pęczek* "bunch" vs. *pąk-pączek* "bud", *rząd-rządy* "government" vs. *rząd-rzędy* "row", *sęk-sączek* "knot" vs. *sączek* "filter", *wiąz-wiązy* "elm" vs. *więzy* "bonds".

The above survey of the vocalic 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 recalcitrant 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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