

Brazilian Portuguese vowel nasalization: secondary aspects

1. The process of vowel nasalization in Portuguese has been a fascinating topic for investigation since the earliest days of Romance philology, and much energy has been expended to determine the origin, development, and contemporary manifestations of the Portuguese nasal vowels. Despite the large amount of scholarly activity devoted to the nasal vowels, however, surprisingly little attention had traditionally been paid to the manner in which they are recognized and produced by native speakers, other than a few traditional phonemic analyses. More recently, aspects of the Portuguese nasal vowel system have been investigated within the framework of generative phonology, with a view toward motivating a series of highly abstract structures underlying the forms of modern Portuguese; as a consequence, more attention was paid to the various details of the vowel nasalization process. The present paper is offered as an addition to the synchronic studies of Portuguese vowel nasalization, since the nasalization process presents several unique peculiarities which warrant a more detailed investigation. The object of this report is to bring up for discussion several aspects of vowel nasalization in Portuguese which have either been neglected in the literature, or which have received incomplete or conflicting descriptions. Other than an introduction to the general problem of the Portuguese nasal vowels, no attempt will be made at reanalyzing areas which have been adequately covered in other studies, even when the opinions of the present writer differ radically from those of other investigators. In particular, no mention will be made of the phonemic nasal diphthongs, perhaps the most controversial and widely discussed aspect of Portuguese

phonology. Discussion of this problem in the light of modern phonological theory may be found in Hensey (1968), Saciuk (1970), Brasington (1971) and St. Clair (1971), while some counterproposals are offered in Lipski (1973b). Also left out of the discussion is the so-called 'rule of denasalization,' accounting for such alternations as *bom* ~ *boa*, etc. A survey of this problem, which is intertwined with many other aspects of Portuguese phonology, would carry the discussion too far afield, since given the current state of psycholinguistics the question boils down to an unresolvable argument between proponents of various linguistic theories. For some differing views on this matter, see Saciuk (1970:209f) and Foley (MS).

The data presented below pertain to the 'Carioca' dialect of Brazilian Portuguese, spoken in Rio de Janeiro, although many of the conclusions drawn from these data may be carried over to other dialects of Portuguese. The restriction to a single dialect is necessitated by the widely divergent manifestations of the vowel nasalization process among the various Portuguese dialects, which defy placement under a common rubric.¹

Brazilian Portuguese generally exhibits only the following nasal vocalic segments: [ĩ], [ẽ], [õ], [ō] and [ũ]. Phonetically, they enter into distinctive oppositions with the corresponding oral vowels, both word-internally and word-finally. For the purposes of this study, they will be described by the features 'high,' 'mid,' 'front' and 'back,' which provide a reasonably accurate portrayal of the Portuguese vocalic system.²

2. Among the earlier studies of the Portuguese nasal vowels, there have emerged two fundamental methods of phonological

¹A rough idea of the order of magnitude of such variation may be gained through studying the papers of Lacerda and Head (1962), Lacerda and Hammarström (1952) and Lacerda and Rossi (1958).

²The controversial question as to whether the Portuguese vocalic system should be described with three or four distinctive degrees of aperture is not relevant to this paper. A four-degree system is used here for aesthetic reasons as well as for considerations of the general structure of the language, since it provides a description paralleling the actual structure of the Portuguese vocalic system. At no point, however, is any conclusion reached in this paper which is dependent on the choice of distinctive features. For some discussion of the feasibility of utilizing a four-degree system, see Lipski (1973a). In Naro (1971) attempts at motivating a three-degree system utilizing binary features may be found, while Veith (1970) suggests the possibility of a single ternary feature of vowel height in Portuguese.

interpretation. The first interpretation entails the positing of a separate series of nasal vowel phonemes which are in no way to be equated with the corresponding oral vowel phonemes. Alternatively, many investigators have analyzed each instance of a nasal vowel as an oral vowel phoneme followed in the same syllable by some sort of nasalizing phoneme.

Head (1965:65-78), utilizing the superficial phonemic contrasts between oral vowels and nasal vowels, has seen the need to posit a complete series of nasal vowel phonemes /ĩ/, /ẽ/, /ã/, /õ/ and /ũ/. It is to be noted, in particular, that specifying a separate phoneme /ã/ completely obscures the true nature of the raised pronunciation [õ] of this vowel, as will be described below. However, remaining totally within an autonomous phonemic framework, Head's arguments are impeccable.

A strong phonemic argument in favor of the claims for Iberian Portuguese with respect to separate nasal vowel phonemes results from the phonetic realization of triplets such as:

<i>vi</i>	[vi]	'I saw'
<i>vim</i>	[vĩ]	'I came'
<i>vime</i>	[vĩmə]	'wicker'

In the standard Lisbon-Coimbra dialect, there is a tendency to eliminate final unstressed vowels, with the result that *vime* tends to be pronounced [vĩm], thus yielding a three-way contrast between oral vowel, oral vowel plus nasal consonant in the same syllable, and nasal vowel. This situation is analogous to the French triplét *beau* [bo], *bon* [bõ] and *bonne* [bõn].³ A similar situation, however, does not fully obtain in the modern Carioca dialect. While in this dialect there is also a noted tendency to weaken or occasionally even drop unstressed vowels in final position, there seems to be at the same time a strong awareness of their presence, even when they have all but disappeared from normal pronunciation. For example, Portuguese phonotactics generally does not tolerate word-final stops; thus, borrowed words ending in a stop receive a paragogic final *e*: *time* 'team,' *clube* 'club,' etc. If final unstressed vowels were phonologically deleted in the Carioca dialect when they ceased to be pronounced in

³This analysis is pursued at length by Lüdtke (1953:213) and elaborated by Head (1965:94-5).

casual conversation, one would expect the dialect to develop a tolerance for words ending in a stop, which is in fact not the case.

The alternate phonemic solution is to consider each occurrence of a nasal vowel to represent an oral vowel phoneme followed by a nasal consonant or an 'archiphoneme of nasality,' or to be dominated by a separate phoneme of nasality. The majority of phonemic studies of Brazilian Portuguese have adopted some variant of this interpretation. The fundamental basis for such an assumption seems to be that nearly every instance of a nasal vowel in opposition with a corresponding oral vowel is either followed orthographically by a nasal consonant, or is marked with the *til* ~ indicating nasality. In particular, Morais-Barbosa (1965) has considered each nasalized vowel to be followed in the same syllable by an archiphoneme of nasality /N/. In those cases where a nasal consonant appears, at least orthographically, Morais-Barbosa's statement is tantamount to claiming that vowels are nasalized by a following tautosyllabic nasal consonant. This can be substantiated, in the Carioca dialect, by the lack of contrast between nasal vowels and oral vowels followed in the same syllable by a nasal consonant. On the other hand, in those cases where nasalization is merely indicated by the *til*, or not orthographically indicated at all, Morais-Barbosa's archiphoneme of nasality becomes in fact an abstract underlying form, e.g.:

<i>fim</i>	[fi]	/fiN/	'end'
<i>lã</i>	[lẽ]	/laN/	'wool'
<i>tempo</i>	[tẽmpu]	/teNpo/	'time'
<i>muito</i>	[mũj ^{ntu}]	/mujNto/	'much'

Within the framework of generative phonology, the same analysis could be arrived at by requiring either a morpheme structure constraint or an intermediate rule, by means of which word-internal nasal consonants would be homorganic with following obstruents, with subsequent rules nasalizing the preceding vowel and then deleting the nasal consonant.

Other studies of Brazilian Portuguese, most notably that of Hall (1943), have posited a separate phoneme of nasality /~/. This phoneme would be superimposed on an oral vowel phoneme in the same fashion that suprasegmental phonemes such as stress

or pitch are superimposed on various vocalic segments. Obviously, the difference between positing a series of oral vowel phonemes plus a single phoneme of nasality and positing an entire series of nasal vowel phonemes is largely a matter of terminology, and does not result in a substantially different analysis from the standpoint of the overall phonological system.

As another variant interpretation, the analysis of Reed and Leite (1947) treats the nasal vowels as phonemically oral vowels followed by a nasal consonant. A nasal vowel in phrase (word) final position is analyzed as being followed by a phonetic [ŋ] or [j], both arising from phonemic /n/.

The above studies, and others like them, have all sought to determine whether Brazilian Portuguese nasal vowels are mono- or biphonemic. Although some of the investigators, notably Head and Morais-Barbosa, utilized actual performance data in their arguments, the end result of the analyses was the placement of nasal vowels into one of two categories: single independent phonemes or positional variants. This classification procedure, which depends only on formal patterns, is often quite arbitrary. The various studies cited above point eloquently to the fact that one can, depending on the particular data considered, and also on the data ignored, present a suitable case for either possible interpretation of the nasal vowels. A more realistic analysis, however, would concern itself with the extent to which the surface form of a Portuguese word can be predicted from the general structure of the language and from demonstrably productive rules. In order to investigate the manner in which vowel nasalization is implemented in the grammars of Brazilian speakers, one must turn to the structure of the entire language, as well as to diverse aspects of the nasalization process itself.

In attempting to formulate an accurate picture of vowel nasalization in the Carioca dialect, two major obstacles crop up immediately. The first difficulty lies in the above-mentioned different manifestations of the nasalization process among the various Portuguese dialects, a problem somewhat alleviated by restricting discussion to a single dialect. A more fundamental difficulty, and one applying to any analysis which is undertaken, is the variation of aspects of the nasalization process observable within the same dialect. Basic to this variation seems to be the

level of literacy of the individual speaker. It is very possible that a speaker of Portuguese is more likely to analyze a phonetic nasal vowel as consisting of an oral vowel plus a nasal segment if he is aware of the spelling of the word involved. Morais-Barbosa (1961:703) tells of an experiment in miniature realized in Lisbon. Speakers aware of the spelling of a word such as *campo* [kâpu] "heard" FIVE sounds, while illiterate speakers often distinguished only FOUR. The interpretation of such an experiment must be tempered by the existence of so-called 'transition sounds' often observed when a nasal vowel is followed by a stop, as will be discussed below. Morais-Barbosa's results do point, however, to the sort of difficulties to be encountered when dealing with vowel nasalization in a socially and linguistically heterogeneous speech community.

On the other hand, there are phenomena exhibited in 'sub-standard' Brazilian speech which indicate that illiterate speakers may in fact analyze nasal vowels as a sequence of oral vowel plus nasal consonant. This is hinted at, for example, by the reduction of present participle forms, which end in the sequence *-Vndo* [Ṽⁿdu] to an ending in [Ṽnu]. One may also observe a reduction of the group *-Vmb-* [Ṽ^mb] to [Ṽm]:⁴

<i>falando</i>	[felẽ ⁿ du] → [felẽnu]	'speaking'
<i>abrindo</i>	[vbrĩ ⁿ du] → [vbrĩnu]	'opening'
<i>também</i>	[tã ^m bẽj] → [tã ^m ẽj]	'also'

Much research is called for to determine the extent of the influence of literacy on this and other phenomena, and until such research has been completed, no completely general statements about vowel nasalization in Portuguese are possible. The data presented below represent the speech of educated speakers of the Carioca dialect, and therefore the results obtained from the data may be considered valid only for this class. It is quite possible that a substantially different analysis would emerge from a study realized through untutored or illiterate speakers.

3. The most easily observable manifestation of vowel nasalization in Portuguese occurs when a nasal vowel is followed in the

⁴Further examples of such phenomena may be found in Thomas (1969:220) and Vásquez Cuesta and Mendes da Luz (1961:89).

same syllable by an orthographically indicated nasal consonant. Historically, these nasal vowels derived from phonetic sequences of oral vowel plus nasal consonant, as may be seen by comparing the Portuguese forms with their Spanish counterparts:

SPANISH	PORTUGUESE	GLOSS
<i>yendo</i> [jéndo]	<i>indo</i> [ĩ ⁿ du]	'going'
<i>tiempo</i> [tjémpo]	<i>tempo</i> [tẽ ^m pu]	'time'
<i>cambio</i> [kámbjo]	<i>cambio</i> [kã ^m bju]	'change'
<i>mundo</i> [múndo]	<i>mundo</i> [mũ ⁿ du]	'world'
<i>onda</i> [ónda]	<i>onda</i> [õ ⁿ dẽ]	'wave'

The historical evolution then nasalized the vowel preceding the nasal consonant, and this consonant was phonetically dropped.⁵ It is not necessarily the case, however, that the present-day Portuguese nasal vowels which arose in such a fashion may be analyzed as a sequence of vowel plus consonant. It seems to be the general opinion of native Brazilian scholars that a synchronic extension of the historical process is still in effect. Statements to this effect can be found both in formal linguistic descriptions such as those of Mattoso Câmara (1953) and Reed and Leite (1947) and in grammatical treatises such as that of Abreu and Ráneh (1966). Such statements, while reflecting the opinion of native (usually linguistically trained) speakers of Brazilian Portuguese, do not provide in themselves conclusive proof of the synchronic existence of a vowel nasalization rule for all speakers of the language, especially speakers with no training in linguistics or in the history of their language. They do, however, point to the fact that an awareness of the possibility of such a rule exists among certain perceptive speakers of the language.

A possible means of justifying the claim of a synchronic vowel nasalization rule in the modern Carioca dialect lies in an examination of the occurrence of nasal vowels in Portuguese. Fully nasalized vowels, i.e. those capable of entering into a phonemic opposition with corresponding oral vowel, occur phonetically either before a consonant or word-finally. Such a distribution points to an underlying nasal consonant in the grammars of many speakers, at least in those cases where the nasal vowel appears before a phonetic consonant. For, assuming the existence

⁵For a description of the historical evolution of the Portuguese nasal vowels, see Williams (1962:90-91).

of separate nasal vowel phonemes, one would have to formulate a sequential constraint which would allow them to appear only word-finally or before another consonant. Such a rule, while of course theoretically possible, seems quite bizarre, and is not in keeping with the general pattern of vowel nasalization. When a process of vowel nasalization is introduced into a language, it generally begins by nasalizing vowels followed in the same syllable by a nasal consonant.⁶ While subsequent modifications may render the resulting nasalized vowels merely residues of a finished process, the phonetic occurrences of nasal vowels in Brazilian Portuguese point to a process of nasalization still in operation. It seems, therefore, that words ending in a nasal vowel may also be analyzed as containing an underlying final nasal consonant, in keeping with the general process of nasalization. One may in fact observe vacillations in rapid speech which point to the productivity of such a nasalization rule in word-final position:

<i>quem é?</i>	[kɛ̃jé] ~ [kɛ̃pé]	'who is it?'
<i>lã azul</i>	[lɛ̃zúw] ~ [lɛ̃nezúw]	'blue wool'
<i>homen alto</i>	[õmɛ̃jáwtu] ~ [õmɛ̃páwtu]	'tall man'

Such observations suggest that words ending in a phonetic nasal vowel may be analyzed by many speakers as ending in the sequence of oral vowel plus nasal segment. In such cases, the evidence suggests a general nasalization rule in Brazilian Portuguese of a very basic nature:

$$(1) \begin{matrix} V & N \\ 1 & 2 \end{matrix} \left\{ \begin{matrix} C_1 \\ \# \\ 3 \end{matrix} \right\} \rightarrow \tilde{V} \quad \phi \quad 3$$

4. The data presented above constitute a relatively complete survey of vowel nasalization in Brazilian Portuguese in those cases where the nasal vowels appear to be analyzable as being followed in the same syllable by a nasal consonant. Since it is only in these positions where phonemic nasal vowels occur in Portuguese, the description could well be terminated at this point. To do so, however, would be to fail to describe the pheno-

⁶So general, in fact, does this process seem to be, that it has been posited as a phonological universal by Ferguson (1963) and Greenberg (1966:509). Lightner (1970) and other authors have utilized these facts to posit this series of developments as a universal schema of vowel nasalization.

menon of vowel nasalization in its greatest generality. Although the phonemic contrast between nasal vowels and corresponding oral vowels may only occur when the vowel is followed superficially either by a consonant or by a word boundary, vowel nasalization in the Carioca dialect is not confined to these positions. It is a commonly observed fact that in most dialects of Portuguese, vowel nasalization occurs more or less generally whenever a vowel is followed by a nasal consonant, regardless of syllabic structure. Since no phonemic contrast results when the nasal consonant is in the following syllable, this observation is usually awarded no more than a passing comment. It has been the observation of the present writer that vowel nasalization in the Carioca dialect occurs regularly when /a/ is followed by any nasal consonant in the next syllable, and also when any vowel is followed by [ŋ], in the latter case for reasons to be discussed shortly. It occurs with somewhat diminished regularity in other cases. This nasalization before a nasal consonant in the following syllable is much stronger than the ordinary assimilation to be found in any language when a vowel comes in contact with a nasal segment; in fact the actual degree of nasalization is often as strong as the 'phonemic' nasal vowels. Vowel nasalization before a nasal consonant in the following syllable, while absent from many descriptions of the language, is an accepted phenomenon in Brazilian Portuguese. A refusal to consider such a process, even though it does not play a distinctive role in the Carioca dialect, would be a refusal to admit the most general source of vowel nasalization: contact with a nasal segment. Although this latter sort of nasalization in the Carioca dialect is much more marked in some words than in others, it appears to be a basic and ever-spreading facet of the vowel nasalization process, in fact its most general manifestation, and therefore the basic nasalization rule must be further extended to cover every instance of vowel nasalization, phonemic or otherwise. These developments indicate that Brazilian Portuguese is moving in the direction of adopting the maximally general universal schema of vowel nasalization (cf. Lightner, 1970:200f.), roughly:

$$(2) V \rightarrow \tilde{V} / \text{---}N$$

At present, of course, this state of affairs has not been reached,

and it is doubtful whether the process will ever be extended to include, for example, nasalization across word boundaries. Nevertheless the (perhaps asymptotic) approach to the posited universal schema may be clearly observed in Brazilian Portuguese, thereby adding additional plausibility to the notion of a universal nasalization process.

5. A word should be added at this point about the statement often heard to the effect that, when a Portuguese nasal vowel is followed in the same syllable by a nasal consonant, this consonant is dropped only if the consonant following the nasal is a continuant (cf. Saciuk, 1970:198). This statement may not be quite accurate, for it appears that what actually happens is not a retention of nasal consonants before stops, but rather a prenasalization of the consonant immediately following the nasal vowel. The fact that the consonant following the nasal vowel is usually homorganic to the orthographically indicated nasal consonant has led to the mistaken impression of retention. It is this confusion which led Hall (1943) and Feldman (1967) to postulate the phonemes /ⁿd/, /^mb/, and /ⁿg/. Modern analyses have demonstrated that prenasalization in fact takes place; Head (1965:189) has shown that the phenomenon occurs with the continuant consonants as well as with the stops. Since Portuguese contains no phonemic nasal fricatives, this latter observation is likely to go unnoticed by many speakers. It is also obvious that prenasalization does not always occur, as evidenced by Morais-Barbosa's observations cited above. In those cases where such prenasalization does occur, however, it may be provisionally handled by a simple phonetic rule, applying after all vowel nasalization rules; roughly:

$$(3) \phi \rightarrow \begin{bmatrix} +nas \\ aant \\ \beta cor \\ \gamma cont \end{bmatrix} / \tilde{V} \text{---} \begin{bmatrix} C \\ aant \\ \beta cor \\ \gamma cont \end{bmatrix}$$

Some sort of additional phonetic detail features would also be needed to indicate the transient nature of the inserted segment. A more accurate analysis would treat the process of prenasalization as a form of diphthongization, defining diphthongization along the lines suggested by Andersen (1972), by imparting a

mora structure to the consonant undergoing prenasalization. For the present time, however, it is not necessary to go into this kind of detail in order to describe the basic phenomenon.

An alternative analysis of these events is possible if one chooses to adopt a more abstract phonological description; i.e. a description based more directly on morphophonemic alternations rather than exclusively on surface phenomena. The homorganic nasal consonants may be regarded as being generated by a rule of nasal assimilation and the *n*-deletion rule then restricted to apply only before word boundaries, or, in the case of an abstract analysis of nasal diphthongs, before word boundaries and /N/ (cf. Saciuk, 1970). In this case, some sort of late phonetic rule will be required to account for the instability of the homorganic nasal consonant. In the light of the presently available evidence, acceptance of such an analysis is contingent upon acceptance of an abstract analysis of nasal diphthongs and other ancillary nasalization phenomena, since the interpretation offered by (1) and (3) more directly accounts for the surface manifestations.

6. The above description fairly accurately characterizes the basic process of vowel nasalization as exhibited by many speakers of Brazilian Portuguese. A further point which must be considered at this time is the restriction of nasalization to the vocalic segments [i], [e], [v], [o] and [u]. This restriction is ordinarily not explicitly discussed, it generally being considered sufficient to remark that the nasalized allophone of /a/ is the raised variant [v]. Nonetheless, it seems significant that only the higher vocalic segments are found in nasalized form, since historically there was indeed a process raising the lower vowels during nasalization. The restriction, in modern Portuguese, to the higher vowels in position of nasalization implies the need for some sort of rule which bars [e], [a] and [o] from occurring in nasalized form. Unlike in French, where the alternations between nasal vowels and oral vowels are clearly indicated, there are relatively few valid morphophonemic alternations in Portuguese which call for a rule raising underlying /e/, /a/ and /o/ when in position of nasalization. What appears to be present in most cases is a general phonotactic constraint barring the lower vowels from occurring in nasalized form. Such a

constraint may be stated as such within the feature framework considered in this paper, but the result is a rather awkward looking rule. A further generalization, however, is perhaps possible. The Carioca dialect, together with most other Portuguese dialects, appears to permit only the higher vowels to occur in nasalized form. The vowels /i/, /e/, /o/ and /u/ are specified in a four-degree system as [+high]. The segment [ɐ] is ordinarily specified as [-high] and [+mid]. In nasalized form, however, [ɐ̃] has an observable tendency to raise even further to a height between that of [e] and [i], there being no other central vowels for it to interfere with.⁷ Such an observation lends support to the claim that in fact only 'high' vowels occur in nasalized form in Brazilian Portuguese, and leads to a rather simple formulation of the vocalic restriction in position of nasalization:

(4) $\tilde{V} \rightarrow [+high]$

Within a three-degree binary system, which is phonetically less accurate but phonologically often more expedient, rule (4) may be expressed by requiring simply that all nasalized vowels be [-low] (cf. Saciuk, 1970:198).

7. Another highly interesting feature of the Portuguese vowel nasalization process is the formation of word-final nasal diphthongs. In Brazilian Portuguese, the nasal vowel [ẽ] never appears alone in word-final position, but only as the nasal diphthong [ẽj]. This word-final diphthongization occurs whether or not the final vowel is stressed:

<i>homem</i>	[ómẽj]	'man'
<i>também</i>	[tẽmbẽj]	'also'

In unstressed word-final position, the nasal vowel [õ] never occurs by itself, but only as part of the nasal diphthong [õw̃]:

<i>falam</i>	[fálõw̃]	'they speak'
<i>tomam</i>	[tõmõw̃]	'they take'

In stressed word-final position, however, contrast is possible between [õ] and [õw̃], indicated by the orthography:

<i>irmão</i>	[irmõw̃]	'brother'
<i>irmã</i>	[irmõ]	'sister'

⁷See, for example, Dahl (1964:316) and Stevens (1954).

In order to account for the predictable cases of word-final diphthongization, St. Clair (1971:99-100) has posited a general rule which produces a glide at the end of all word-final nasal vowels, with subsequent rules removing the undesired *[õw̃], *[ũw̃], *[ĩj], etc. The contrast between [õ] and [õw̃] is not covered by St. Clair. Saciuk (1970:207) has considered a simple rule which attaches the appropriate glide to word-final [ẽ] and [õ], which must be ordered after the nasalization rule and before a secondary nasalization rule which nasalizes glides and vowels contiguous to nasalized vowels. The need for separate ordered rules in this case is not supported by the complete lack, in the Carioca dialect, of diphthongs consisting of a nasal vowel plus an oral glide. The formation of word-final nasal diphthongs in cases such as the one above appears to be a unified process, part of the general nasalization condition, not a secondary process arrived at by successive approximations. Brazilian Portuguese simply does not tolerate final sequences such as [ẽ] and unstressed [õ]. What appears to be in operation is in effect a surface phonotactic constraint which attaches a nasalized glide at the appropriate place in the word, in order to satisfy the surface structure of the language, a phonotactic constraint learned by each native speaker as part of his automatic competence. The simplest way of stating this constraint is to require, for all instances of word-final [ẽ] and for all unstressed final [õ], that a nasalized glide be attached which agrees with the preceding vowel in frontness or backness, and to allow the redundancy rules of Portuguese to further specify these glides as [j] and [w̃], respectively. While such a rule would adequately describe the static situation for many speakers of Brazilian Portuguese, it would leave certain dynamic aspects of word-final diphthongization untouched. It would not indicate, for example, the precise nature of the relationship between the occurrence of certain nasal vowels and the appearance of particular glide elements. In order to arrive at a more comprehensive picture of this process, it is necessary to broaden the scope a bit and consider some further observations on the phonetics of Brazilian Portuguese.

As far back as the work of Nobiling (1903:136-7), it was noted that, in certain dialects of Brazilian Portuguese, most notably the dialect of São Paulo but also in the Carioca dialect, word-final

stressed [õ] did not occur alone, but was followed by an unrounded, homorganic nasalized glide element which Nobiling transcribed as [ẽ] and which resembles an [ŋ] without complete oral closure. Nobiling further noted that, in these same dialects, a nasalized [j] appeared after final [i] and [ẽ] and a nasalized [w̃] appeared after final [õ] and [ũ]. In other words, the process described by Nobiling is the attachment of a glide homorganic both in place of articulation and in rounding to final nasal vowels, a process which from a phonetic point of view appears quite 'natural' and straightforward. In the modern Carioca dialect, this diphthongization does not occur with the regularity suggested by Nobiling, except in the case of final [ẽ]. Examples may be found, however, of the diphthongization of other word-final nasal vowels in the fashion described by Nobiling, and there consequently arises a great temptation to posit a maximally simple rule of homorganic diphthongization, which has not attained its full degree of generality in the Carioca dialect. This rule could be posited in the form of a quasi-universal schema, from which the various Portuguese dialects extract specific and limited rules of diphthongization. On the basis of such a theoretical proposal, one could offer the prediction that Brazilian Portuguese will eventually attain the full generality of this rule, adducing as evidence the various cases of diphthongization which have been noted. The beauty and elegance of such an analysis is marred, however, by the recalcitrant cases of word-final unstressed [õ], to which a [w̃] and not a homorganic [ẽ] is affixed. To understand the reasons behind this apparently anomalous development, one must consider certain aspects of the evolution of the Portuguese nasal vowels.

Historically, the modern Portuguese nasal diphthong [õw̃] comes from three distinct sources: Latin -ANU > Old Port. -ã (e.g. CRISTANU > *cristão*); Latin -ANE > Old Port. -am [õ] (e.g. CANE > O. P. *cam* > *cão*); Latin -ONE > Old Port. -om [õ] (e.g. RATIONE > O. P. *razom* > *razão*). The reasons behind this three-way merger are exceedingly complex, and have been widely discussed throughout the literature.⁸ Let it suffice at the present time to note that, in addition to a series of analogical factors, the

⁸A survey of the literature, including some tentative proposals, is offered in Lipski (1973d).

merger is the result of an apparently spontaneous diphthongization of word-final nasal vowels in Old Portuguese. By means of this process, Old Portuguese -am became diphthongized to [õw̃], perhaps via the intermediate stage *[õẽ], and -om became diphthongized to *[õw̃]. Shortly thereafter, *[õw̃] shifted to [õw̃], and the merger was complete. The modern Portuguese forms in -ã, coming from Latin -ANA, and in -om, coming from Latin -ŌNUM, did not undergo this evolution, presumably because at the time in question the two vowels brought together by the loss of intervocalic -n- had not yet coalesced into a single vowel. For some reason, Old Portuguese appears to have preferred nasal diphthongs over single nasal vowels in final position, thus occasioning the diphthongs in question. Moreover, there also seems to have been a drive toward achieving a maximum amount of differentiation between the two morae of the diphthongs, thus further separating them from single nasal vowels. It can be shown, on the basis of a comparison of the reduction of falling diphthongs throughout the Romance languages and elsewhere,⁹ that the diphthongs [õw̃] and [õẽ] are interderivable; that is, during a purely phonetic process of monophthongization, both diphthongs tend to reduce to the same vowel, approximately [õ]. Precisely this same drive toward maximum differentiation seems to be responsible for the change, in Iberian Portuguese, of [ej] and [ẽj] to [ɲ] and [ɲj], respectively, a change which, at least so far, has not appeared in the Brazilian dialects.

The preceding remarks illustrate the origin of the diphthongization of word-final unstressed [õ], thus highlighting the impossibility of positing a simple rule of homorganic glide attachment of the sort discussed above. From a historical point of view, the events surrounding the diphthongization of final nasal vowels involve much more than a simple phonetic process, and result in a synchronic situation which defies analysis in terms of one single rule.

Having thus covered the matter of unstressed final [õ], the most relevant question to be asked at this point is, what about stressed final [õ]? Should this vowel also be included as part of the

⁹A number of examples of the equivalence of diphthongization and monophthongization, utilizing data from a number of different language families, may be found in Andersen (1972). Further theoretical considerations, based on comparative Romance data, are found in Lipski (1974).

diphthongization process which took place in early Portuguese? Given the highly sporadic nature of the events in question, it is impossible to provide an answer with the degree of certainty required to consider the matter closed, but all available evidence suggests that the answer is yes. The spontaneous diphthongization of stressed final [õ] to [õw̃] in Brazilian Portuguese was noted as far back as Nobile (1903) and has been more recently reported for the Carioca dialect by Houaiss (1958:285). Leite de Vasconcellos (1970:79) discovered this change in dialects of Portugal, while Dalgado (1900:65) reported the process in the Portuguese spoken in Goa. Whether or not all instances of word final -ã will become diphthongized, thus paralleling the events of early Portuguese, is impossible to determine at present, but it is clear that by assuming the stronger hypothesis that the diphthongization process is still in effect, it is possible to more adequately account for the presently-occurring forms. The unrounded glide element which may be heard after word-final stressed [õ] may signal a stage on the way toward diphthongization to [õw̃]. If this is indeed the case, then the rule of homorganic glide attachment must be subject to an overriding influence of still other phonological processes, with the end result of producing a series of heterogeneous diphthongs. Only time will provide the conclusive test, but at present it appears that modern Brazilian Portuguese is in many ways in a state of transition towards configurations resembling those formed many centuries ago.

8. One final observation which is of interest to the general question of Portuguese vowel nasalization concerns the various cases of so-called 'progressive nasalization,' in which a vowel was nasalized by a preceding nasal consonant. We have, for example, *MULTU* > *multo* > [mũj̃ntu], *MATER* > *mãe* [mãj̃] 'mother,' *MI* > *mim* [mi] 'me,' etc., as well as cases of an intrusive palatal nasal in forms such as *NIDO* > *nio* > *ninho* [nĩɲu] 'nest,' *MEA* > *minha* [miɲɐ] 'mine (f.),' and so forth. Saciuk (1970:203) has posited a minor rule of progressive nasalization to account for these and similar forms. It is not immediately apparent, however, that these forms must necessarily be derived by a rule, since there are few if any alternations which would support such an analysis. A possible alternation is the masculine-feminine pair *meu-minha*, but here there is a difference of vowel timbre as well

as of nasalization. More recondite examples include *multi-muito*, *ninho-nidificar*, etc. In any case, it is interesting to consider the manner in which these forms evolved through progressive nasalization. In Portuguese, any vowel following a nasal consonant is lightly nasalized, but in order for such nasalization to become phonemic it is necessary that native speakers consider the difference to be relevant; i.e. that the nasalized vowel occur in an environment in which a phonemic nasal vowel could occur. In the case of Portuguese, this is either before a consonant, or word-finally. The latter possibility accounts for the evolution of *mi* to *mim*, for since the nasalized vowel was already in final position, it could be phonemicized. The same probably holds true for the nasalization of the diphthong in *mãe*, from *mai*. In the case of *muito*, it was the presence of the *t* which provided the environment leading to the strongly nasalized diphthong. In the remaining cases, the key to a solution lies in the intrusive glide element [j] which generally appears after a stressed [i] in hiatus with a following vowel. In the evolution of Portuguese, this glide element played the role of a consonant in providing an environment in which distinctive nasalization could take place. It was shown in Lipski (1973c) that this configuration was responsible for the insertion of a palatal [ʃ] in forms originally ending in -ĪNUM; e.g. *VĪNUM* > *vīo* > *vinho* 'wine,' *PĪNUM* > *pīo* > *pinho* 'pine,' etc. Here the nasalized vowel was followed by the intrusive (and progressively nasalized) glide [j], and the resulting environment was conducive to the formation of the palatal nasal. In modern Brazilian Portuguese, it is very frequent for the palatalized nasal to reduce to a mere nasalized glide [j]; thus *tenho* [tẽɲu] ~ [tẽju] 'I have,' and so on. In the case of a form like *NIDO* > *nio* [nĩjo], the phonetic configuration was such as to allow the nasalized [ĩ] to become phonemic, later resulting in the insertion of the epenthetic [ʃ].

In the modern Carioca dialect, it is possible to observe progressive vowel nasalization, and it remains to be seen whether any new forms will be created through this process. The process seems to be an on-going one, and modern spoken Brazilian Portuguese offers many instances which could ultimately lead to new formations.¹⁰

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