Obstruent Nasals Exist!

The received position on phonological features is that the features [+nasal] and [+obstruent] are phonetically (and, consequently, phonologically) incompatible (Ladefoged and Maddieson (1996), Solé (2007)). In this paper, I argue against this position and show that classifying what have been called *post-stopped nasals* as *obstruent nasals* (i.e., [+obstruent, +nasal]) leads to a better understanding of their phonetic realizations, their phonological behaviour, and the phonology-phonetics interface.

Several dialects of the Chinese language groups Cantonese and Shanxi have been claimed to have *post-stopped nasals* word-intially where reflexes in related dialects have simple nasal stops (Hu (2007)). Similar segments surface in Acehnese (Durie (1985)) and dialects of Jambi Malay (Tadmor & Yanti (2004)) in syllable-onsets as reflexes of $N.C_{[+voiced]}$ in related dialects and have been labelled *post-occluded nasals*. Henceforth, I shall use the phrase *post-stopped nasals* to refer to these segments.

Phonetically, *post-stopped nasals* consistentantly differ from regular *pre-nasalised stops* (PNS) observed in the world's languages. *Post-stopped nasals* are typified by the following phonetic characteristics (Maddieson & Ladefoged (1993)):

I. Higher oral pressure during the nasal murmur than during simple nasals or PNS.
II. A relatively weaker nasal murmur than PNS or simple nasal stops.
III. A strong observable release burst unlike with PNS or simple nasals.
IV. No clearly observable "oral" portion unlike with PNS.

Reclassifying post-stopped nasals as *obstruent nasals*, i.e., [+obstruent, +nasal], accounts for these characteristics. The feature [+obstruent] is marked by an increase in oral pressure behind the constriction of a consonant (Clements and Osu (2002)). Therefore, the increased oral pressure (I) and decreased nasal murmur (II) in post-stopped nasals can be seen as a trade-off between the usual manifestations of the features [+obstruent] and [+nasal]. Furthermore, a strong release burst (III) is now expected because of the oral-pressure build-up behind the constriction. Finally, there is no expectation of an "oral" portion during the production of these segments (IV).

Phonologically, *post-stopped nasals* have been argued to be identical to PNS in other languages as the two types of segments never contrast in any language (Maddieson & Ladefoged (1993)). However, such a phonological analysis grants the phonology-phonetics interface tremendous lee-way as the same phonological features map to substantially different phonetic manifestations.

Futhermore, classifying *post-stopped nasals* as PNS goes against otherwise robust phonological generalizations about PNS regarding contrast. Typical PNS are either phonetic manifestations of simple nasals in 2-way stop contrast inventories (1a) (Durvasula (2007)) or enhanced versions of voiced stops (1b) (Iverson & Samuels (1996)). However, in Jambi Malay and Acehnese, these generalisations do not hold for the *post-stopped nasals* as they contrast with voiced stops and simple nasals in onsets (2).

The attestation of *obstruent nasals* falsifies existing explanations for the transparency of neutral segments (the set of voiceless segments) during nasal harmony in many Amazonian languages as in Barasana (3) – the segment [k] in (3b) permits nasal harmony but remains non-nasal. Usual explanations involve the phonological and phonetic incompatibility of the features [+obstruent] and [+nasal] – which forces the non-nasal manifestation of the transparent neutral segments (Piggott (2003)). However, the data and proposal regarding *obstruent nasals* in this paper undermine such an analysis. In stead, I argue that, phonologically, the [+nasal] feature spreads through the voiceless segments as schematized in (4b), and their surface transparency is a result of gestural alignment to preserve perceptual contrast (Silverman (1997))**.** The nasal specifications on two adjacent tauto-syllabic segments are mapped to a single nasal gesture. In the case of sonorant onsets, the single nasal gesture overlaps with both the sonorant consonant and the following vowel, as this doesn't sacrifice the perceptual contrast of the gesture (4a). On the other hand, with the neutral (voiceless) consonant onsets, the nasal gesture aligns mostly with the following vowel gestures in order to maintain its perceptual contrast (4b).

Classifying *post-stopped nasals* as *obstruent nasals* allows us to straight-forwardly account for their phonetic realizations, maintain otherwise robust cross-linguistic generalizations regarding true PNS, and obtain a deeper insight into the phonology-phonetics interface.

Data

(1) a. PNS 2-way stop contrast inventories

Stop Inventory	Phonetic forms
p	p
m	^{m}b

b. PNS as enhanced voiced stops

Stops Inventory	Phonetic forms
p	p
b	^{m}b
m	m

(2) Jambi Malay (Durvasula (2007))

a. la.**b**a-la.**b**a 'spider' b. ka.**m**ãr 'room'

c. ba.**p**a? 'father' d. ta.**m**^{**b**}at 'to tie' (m^{b} = pre-stopped nasal)

(3) Barasana (Piggott (2003))

a. wãre + re → [w̃ãr̃ẽr̃ẽ] 'to watch' b. mini + aka → [mĩn̂ĩãkã] 'small bird'

(4)

	a. Transparent 'r' that is nasalized phonetically	**b. Transparent 't' that is not nasalized phonetically**
Underlying form (UR)	V r V | [+nasal]	V t V | [+nasal]
Surface Phonological Form (SR) – after nasal harmony	V r V | | | [+nasal] [+nasal] [+nasal]	V t V | | | [+nasal] [+nasal] [+nasal]
Syllable-based gestural mapping	**Gesture V r V** *V-Place* ▬ ▬ *C-Place* ▬ *Velum* ▬ ▬	**Gesture** V t V *V-Place* ▬ ▬ *C-Place* ▬ *Velum* ▬ ▬

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