THE PHONOLOGY OF FINAL GLOTTAL STOPS

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0. Introduction

It has been recognized for quite some time that glottal stops have a special status in phonology. Noting that “phonetically, the glottal stop, unreleased, is the negation of all sound whether vocalic or consonantal,” Firth (1948:124), for instance, goes on to state that within a given phonological system, glottal stop may function as a “minimum or terminus of a syllable, the beginning and the end, the master or maximum consonant,” it may constitute a “metrical pause or rest, a sort of measure of time, a sort of mora or matra,” and finally that “it may be all or any of these things, or just a member of the consonant system according to the language.” Phonologists are especially familiar with rules that insert glottal stop (henceforth, GS) between vowels or before a word- or phrase-initial vowel. In such cases it can be argued that GS has the “prosodic” function of providing a minimal onset to a syllable that would otherwise not have an onset. While in some languages there are further restrictions on such rules (e.g. restricting their application only to stems or to stressed syllables), it is generally assumed that initial (or pre-vocalic) GS insertion has to do with syllable structure, and ultimately, with the phonetic motivation for having an onset in every syllable (see Ohala and Kawasaki 1984).

The same has not always been assumed for final GS insertion, the topic of the present paper. When a vowel uttered after pause acquires a preceding GS, the syllable acquires an onset and hence goes from being “more marked” to “less marked” as a syllable. On the other hand, when a vowel uttered before pause acquires a following GS, it appears that the syllable has gone from being “less marked” to “more marked,” since, as is well-known, the “unmarked” option is for a syllable to end with a vowel, not with a non-vocalic articulation such as a GS. Recognizing this fact, other explanations have been sought. In this paper I wish to consider some of the properties of final GS. In §1 I briefly review the types of functions that have been or could be ascribed to final GS. In §2 I provide a detailed description of final GS in Dagbani, a Gur language spoken in Northern Ghana, in which the conditions on final GS insertion are particularly complex. In §3 I briefly cite other West African languages known to have complex conditions on final GS. Finally, in §4 I consider diachronic and synchronic implications of these findings.

1. Functions of final glottal stop

In this section I would like to consider the potential “functions” of final GS. For the moment I shall assume that it is correct and fruitful to seek specific
functions for phonological properties, although I shall return to this question more critically in §4. With this assumption, we can then ask: what is the function of final GS in language X? Or, if a single phonological property can have more than one function: what are the functions of final GS in language X? For the purpose of the responding to these questions, I shall now consider in the distinctive, demarcative, and expressive functions introduced by the Prague School, as these apply to final GS.

The distinctive function is said to be met by a phonological property which serves to distinguish morphemes, i.e. which is phonemic. In many languages final GS constitutes a member of a consonant system and stands in opposition not only to other consonants, but also in opposition with its absence, as in the following examples from Bantu: Kikuyu?

\[
\begin{align*}
(1) & \quad a. \ k\hat{o}\, & \text{‘to rise’} & b. \ k\hat{\circ}\, & \text{‘to receive’} \\
& \quad \text{n}\hat{i}\, & \text{‘to pulverize’} & \quad \text{n}\hat{i}\, & \text{‘to defecate’} \\
& \quad \text{l}\hat{u}\, & \text{‘to fish’} & \quad \text{l}\hat{u}\, & \text{‘to melt’}
\end{align*}
\]

In this and most other Grassfields Bantu languages, the final GS is distinctive, i.e. it is unpredictable and must therefore be included in lexical representations.

The demarcative function is met by a phonological property which locates the boundary of a domain, e.g. a final word or phrase boundary. Interestingly, while there are languages that are said to have word- (or stem-) initial GS insertion, where the demarcative function of the GS is to mark the beginning of a word (or stem), I know of no language that has word- (or stem-) final GS insertion. However, numerous languages insert a GS before pause. Thus, Vance (1987:13) states of Tokyo Japanese: “...there is always a non-distinctive glottal stop after a short vowel and before a pause.” The same process occurs in Hausa, a Chadic language of Nigeria and environs: “[glottal stop]... is considered as a prosodic feature of pause position, having some kind of demarcative function” (Newman and van Heuven 1981:13). In these cases the GS is claimed to have the demarcative function of marking pauses. Since these pauses often are at the control of the speaker, it is not surprising that pre-pausal GS is often (always?) tied in with the so-called expressive function.

In this latter capacity, a phonological property has a pragmatic function, communicating something about the speaker's attitude or about the speech event. Thus, for Tokyo Japanese Vance (1987:12) also states: “...the glottal stop after a short vowel is more salient when a speaker is excited and emphatic.” In what he identifies as “middle-class Parisian French,” Malécot (1975:51) says that pre-pausal GS “...serves to call attention to a preceding or following element, to abort an unwanted utterance, or to terminate an utterance as quickly as possible in order to get on with the next.” His study, examples appear such as the following:

bon[?]? oui[?]? non[?]? je (ne) veux pas[?]?!
good yes no I don’t want (to)
je l’ai vu, enfin[?]?... il était là
I saw him, after all... he was there
il ne l’a pas fait parce qu’e[?]?... c’est impossible
he didn’t do it because...

Malécot further notes: “...the overall frequency of occurrence of glottal stop in French varies as a function of sex, age, occupation, speaker’s intent, voice level, type of articulation and utterance length” (p.51), suggesting that GS serves exclusively as an expressive or INTONATIONAL function in French.

That final GS may not be limited to a single function is seen from Henton and Bladon’s (1988) study of creak as a “sociophonetic” marker in British English. These researchers note that “...creak correlates with lateness of position in the sentence, accumulating towards the final syllable where it is greater” (p.20) and conclude: “...since creak rate tended to increase considerably with lateness in the utterance... our interpretation of the functions of creak includes a demarcative role. The unit demarcated might be sentence-sized; more plausibly, perhaps, the demarcative use of creak could be as a turn-relinquisher in conversation” (p.24).

Since male-female differences were noted. Henton and Bladon consider, however, that “creak may be regarded primarily as a marker of speech” (p.23).

The issue that arises with respect to observations as have just been cited from Tokyo Japanese, French and British English is whether a (phonetic or phonological property can have more than one function (e.g. both a demarcative and an expressive function in the cases cited). It is tempting, in fact, to view cases of obligatory final GS as arising from the PHONOLOGIZATION of non-obligatory final GS or creak, though as we shall see in §4, this need not be the only source.

In the following section I shall demonstrate from Dagbani, a Gur language spoken in Northern Ghana, that final GS may have such a multiplicity of functions, as defined above, that the whole enterprise of assigning Praguan functions to phonological properties must be called into doubt.

2. Final glottal stop in Dagbani

In a number of West African languages the presence of a final glottal stop is dependent on a combination of phonetic, phonological, morphological, syntactic, semantic and/or pragmatic factors. I have already cited the case of Hausa, a member of the Chadic subfamily of Afro-Asiatic. Although my search has not been exhaustive and although I suspect the phenomenon to be even more widespread, within Niger-Congo, I have found final GS in at least four of the original six (subsequently contested) subfamilies of Greenberg (1966): Fula (Arnott 1970;
McIntosh 1984) in West Atlantic; Akan (Schachter and Fromkin 1968) and Chumburung (Snider 1986) in Kwa; Gokana (Hyman 1983) in Benue-Congo; Kusaal (Spratt and Spratt 1968; England and Ladusaw 1985) and Moha (Rialland 1985) in Gur. In this section I shall provide in some detail the facts surrounding final GS in a third Gur language, Daghanu, and argue that if Praguan functions are relevant at all, final GS in this language will be realized only if a disparate and complex combination of factors coincide. Since there are two sets of factors, one concerning affirmative utterances, one concerning negative utterances, I present each case separately.

2.1. Final GS in affirmative utterances

The first condition that must be met is a phonetic one: GS must precede an actual pause, as in citation forms or at the end of an utterance, e.g.

\[
\begin{align*}
\text{(2) a. } & \text{ on di? 'he will eat'} \quad \text{ on da? 'he will buy'} \\
\text{b. } & \text{ on di kodu 'he will eat a banana'} \\
\text{c. } & \text{ on lo kodu 'he will tie a banana'} \\
\text{d. } & \text{ on da kodu 'he will buy a banana'} \\
\text{e. } & \text{ on zu kodu 'he will steal a banana'}
\end{align*}
\]

In (2a) we see that CV verb roots acquire a final GS when they occur before pause. This GS is absent in (2b), where each verb is followed by the noun object 'banana' (which, as we shall see, lacks a final GS for a systematic reason).

The second, third and fourth conditions are phonological: the prepausal segment must be (a) a vowel; (b) short; and (b) a stem (e.g. non-suffix) vowel. Thus, in (3a) there is no final GS, since the verbs in question do not end in a vowel;\(^6\)

\[
\begin{align*}
\text{(3) a. } & \text{ on dem 'he will play'} \quad \text{ on can 'he will go'} \\
\text{b. } & \text{ on pi 'he will choose'} \quad \text{ on tee 'he will remember'} \\
\text{c. } & \text{ on kuh-i 'he will cry'} \quad \text{ on lab-i 'he will return'} \\
\text{d. } & \text{ on do-gi 'he will cook'} \quad \text{ on kai 'he will count'} \\
\text{e. } & \text{ on di ya 'he ate'} \quad \text{ on dir mi 'he is eating'}
\end{align*}
\]

The GS is missing in (3b) because the stem vowel is long, and in (3c) it is missing because the final (short) vowel is not a stem vowel, but rather a suffix. (3d) shows that certain verbal enclitics also fail to receive a prepausal GS and will thus be analyzed as not constituting stems in their own right.

The fifth condition on final GS is morphological: the prepausal word must be [-N], i.e. must not be nominal in nature. Note first in (4a) that the vast majority of Daghanu nouns (e.g. 139 out of 148 "basic" nouns, or 94%) end in a noun class suffix:

\[
\begin{align*}
\text{(4) a. tib-li 'car'} & \quad \text{dar-gu 'ladder'} & \quad \text{ti-á 'tree'} \\
\text{b. zó 'friend'} & \quad \text{gab-gu 'rope'} & \quad \text{bi-á 'child'} \\
\text{c. má 'mother'} & \quad \text{má 'to cut'} & \quad \text{bá 'father'} \\
\text{d. zá 'millet'}
\end{align*}
\]

Since the final short vowels in (4a) are suffixal, we do not expect nor obtain prepausal GS. In (4b), however, we observe that the few suffixless nouns having the shape CV fail to acquire a GS, though, as shown, their verbal counterparts do. The generalization is that only words that are [-N] are capable of acquiring final GS (if all other conditions are also met). Similar facts are seen in (5).

\[
\begin{align*}
\text{(5) a. mani 'me'} & \quad \text{miin 'us'} \\
\text{b. muna 'him/her'} & \quad \text{bin 'them'} \\
\text{c. wi 'he sees me'} & \quad \text{ot te 'he sees us'} \\
\text{d. wi 'he sees you'} & \quad \text{ot te 'he sees you'} \\
\text{e. wi 'he sees him'} & \quad \text{ot te 'he sees them'} \\
\text{f. wi 'he sees it'} & \quad \text{ot te 'he sees them'}
\end{align*}
\]

In (5a) we see that independent pronouns fail to acquire final GS, as do their clitic object analogues in (5b). In (5c) we see that pronouns function as locative postpositions—in the case of ni 'inside,' which lacks a suffix, we see most clearly how its [+N] status inhibits final GS. Finally, (5d) shows that adjectives are [+N] and morphologically indistinguishable from nouns in Daghanu, though apparently no adjective occurs without a suffix in the language.
Having established that [-N] forms are not eligible for final GS, one is tempted to use this observation as a criterion for nominal status in Dagbani. This essentially works, though with some complications. Thus, consider the forms in (6).

(6a) yinjì? / yinù? 'one'  
á-yòbù 'six'
á-yì? 'two'
á-yòb pòìn 'seven'
á-tà? 'three'
á-nil 'eight'
á-nàhì? 'four'
á-wòì? 'nine'
á-nù? 'five'
pi-à 'ten'

b. nò? 'this'
ño hà? 'that'
pè? 'here'
pè hà? 'there'
c. màa 'that' (right there)
là 'the one in question' (def.)
sò 'a certain' (indef.)

The numerals one through ten are given in (6a). As seen, most consist of an a-prefix followed by a stem. Given that numerals are [-N], the numerals 'two,' 'three' and 'five' follow from our above account, since they end in a short stem vowel. The numeral 'nine' may also be regular, since the phonetic diphthong [əi] is definitely short (i.e., does not consist of a succession of two full vowels). The numerals 'seven' and 'eight' do not show final GS since they end, respectively, in a nasal vs. a long vowel. This leaves the numerals 'one' and 'four,' which show a GS on their second stem vowel vs. 'six,' which for some reason does not.

Finally, the form for 'ten' does not show a final GS because it is [-N], consisting of a stem pi followed by a noun class suffix -à (cf. the corresponding plural form pi-hi, as in pih tà? 'thirty,' lit. ten-three).

In (6b) we see that definitics, which are also [-N] take final GS, though màa in (6c) does not, because it ends in a long vowel. The remaining forms in (6c) do not take GS since neither ends in a stem vowel. -sò is a suffix (replacing the inherent noun class suffix on the form to which it suffices), while là appears to be an enclitic.

The sixth condition on final GS is pragmatic: declarative mood is required:

(7) a. ó nì dì? 'he will eat' vs. ó nì dì: 'will he eat?'
ó nì lò? 'he will tie' vs. ó nì lò: 'will he tie?'
ó nì dà? 'he will buy' vs. ó nì dà: 'will he buy?'
ó nì zù? 'he will steal' vs. ó nì zù: 'will he steal?'

b. ó nì dà kòl dú yìnì: 'will he buy one banana?' (yìnì 'one')
ó nì dà bà-hì à-tà? 'will he buy three dogs?' (à-tà? 'three')

The condition for (7b) is that the final GS is obligatory for final GS insertion in affirmative utterances. The data in (8) show, a negative (declarative) utterance obligatorily ends in a final GS:

(8a) ó kù dì? 'he won't eat' ó kù dà? 'he won't buy'
ó kù lò? 'he won't tie' ó kù zù? 'he won't steal'
ó kù dà? 'he won't play' ó kù càp? 'he won't go'
ó kù tóm? 'he won't work' ó kù sòp? 'he won't help'
ó kù fàn? 'he won't choose' ó kù tèé? 'he won't remember'
ó kù bì? 'he won't be' ó kù nèé? 'he won't slide'
ó kù kòbì? 'he won't cry' ó kù lāb? 'he won't be' ó kù kālì? 'he won't count'
ó kù tò tó? 'he won't tie a friend' (tò 'friend')
ó kù tò kòdù? 'he won't tie a banana' (kòdù 'banana')

In (7a) I have contrasted statements ending in a L tone, and the final vowel is lengthened (and breathy). (7b,c) show the same lack of final GS on numerals and definitics under question intonation, while (7d) shows that WH-questions, as in English, take declarative intonation, here marked by final GS (and the absence of L tone and final lengthening). Although this is not quite precise, I will refer to the pragmatic condition allowing final GS as "declarative."

To summarize, Dagbani has the rule in (8).

(8) Insert a glottal stop if all of the following conditions are met:

a. phonetic condition: before pause
b. phonological condition: after a short, stem-final vowel
c. morphological condition: final word is [-N]
d. pragmatic condition: utterance is "declarative"

This completes the characterization of final GS insertion in affirmative utterances. We turn now to consider final GS in negative utterances.

2.2. Final GS in negative utterances

As complex as the conditions are in (8), they do not suffice to predict all occurrences of final GS. This is because there is a second set of conditions that come to play in negative utterances. As the data in (9) show, a negative (declarative) utterance obligatorily ends in a final GS:

(9) a. ó kù dì? 'he won't eat' ó kù dà? 'he won't buy'
ó kù lò? 'he won't tie' ó kù zù? 'he won't steal'
ó kù dà? 'he won't play' ó kù càp? 'he won't go'
ó kù tóm? 'he won't work' ó kù sòp? 'he won't help'
ó kù fàn? 'he won't choose' ó kù tèé? 'he won't remember'
ó kù bì? 'he won't be' ó kù nèé? 'he won't slide'
ó kù kòbì? 'he won't cry' ó kù lāb? 'he won't be' ó kù kālì? 'he won't count'
ó kù tò tó? 'he won't tie a friend' (tò 'friend')
ó kù tò kòdù? 'he won't tie a banana' (kòdù 'banana')
In (9a) we see that a prepausal verb of the shape CV acquires a final GS in the negative, just as it had done in the affirmative in (3a). In (9b), however, we see that CVN verbs also acquire a final GS, as do CVV verbs in (9c) and CVC-V verbs in (9d). As will be recalled, these same verbs failed to acquire a final GS in the affirmative in (4a-c). In (9e-g) we see that even [+N] forms acquire a final GS in the negative, whether they are suffixless nouns, as in (9e), suffixed nouns, as in (9f), or pronominal enclitics, as in (9g). In fact, no form escapes prepausal GS in a negative (declarative) utterance in Dagbani. An important qualification must be made. As seen in (10a), the prepausal form must occur not just in an utterance containing a negative, but more specifically, it must occur within the scope of the negation itself:

(10a) a. dô sô njû n bi lû njêmâ tê 'a certain man who didn't fall...hit us'
b. dô sô njû n bi lû?...njêmâ tê 'a certain man who didn't fall...hit us'

In (10a) the negation occurs within the relative clause, and hence the final form tê 'us' of the main clause does not fall within its scope. As seen, there is no final GS. In (10b), where a pause is indicated by the three dots at the end of the relative clause, a GS is observed on lû 'fall', because this form does fall within the scope of the negation.

Consider now what happens when an utterance contains multiple pauses, first in the affirmative in (11).

(11a) a. ô n pê doô ni págâ ni biâ 'he will see a man, a woman...he will see woman and woman and child and a child'
b. ô n pê doô...ni págâ...ni biâ 'he will see a man...a woman...and a woman and woman and child and a child'

In (11a) the whole utterance is given with a single pause at the end, while in (11b) there is a pause after doô 'man' and another one after págâ 'woman'. In no case is there a prepausal GS, since in the affirmative, the prepausal form must be [-N]. Now compare (11) with the corresponding negative utterances in (12).

In (12a), where the sentence occurs with only a pause at the end, there is a single, final GS. In (12b), however, there is a GS marking the pause after both 'man' and 'woman'. In fact, EVERY pause falling under the scope of the negation is marked by GS in Dagbani. Thus, corresponding to the utterance in (13a), which naturally occurs without internal pauses is the less natural utterance in (13b).

(13a) a. ô kû pê doô tî tîlî? 'he won't see a big man'
b. ô kû... pê... doô?... tî tîlî? 'he won't... see... a big... man'

Since each prepausal form falls within the scope of negation, (13b) contains four GS's, as indicated.

The final factor to be addressed is that GS does not occur in negative yes-no questions:

(14a) a. ô kû dî: 'won't he eat?' (cf. (9a))
b. ô kû dëm: 'won't he play?' (cf. (9b))
c. ô kû piâ: 'won't he choose?' (cf. (9c))
d. ô kû kûhî: 'won't he cry?' (cf. (9d))
b. ô kû pê doô tî tîlî: 'won't he see a big man?' (cf. (13a))

What this leaves us with is the following summary in (15).

(15) Insert a final GS if all of the following conditions are met:
a. phonetic condition: before pause
b. syntactic condition: final word is within scope of negation

c. pragmatic condition: "declarative" utterance

We now can combine (8) and (15) as follows:
(16) Insert a final GS if all of the following conditions are met:
   a. phonetic condition: before pause
   b. pragmatic condition: "declarative" utterance
   plus either:
   c. syntactic condition: final word is within scope of negation
   or:
   d. phonological conditions: after a short, stem-final vowel
   e. morphological condition: final word is [-N]

What (16) reveals is that the phonetic and pragmatic (or intonational) conditions are held constant in all utterances, and combine either with a single syntactic condition (c) or a combination of phonological and morphological conditions (d) and (e).

By far the most intriguing condition is (c), which as far as I know has no parallel in any other language (see however note 18). Final GS has a superficial resemblance to boundary tones, whether they are invariant markers of prosodic domain ends or are chosen from a set of melodies marking different intonations. However, one cannot simply divide (12b) into three intonational phrases (IP's), and mark each "negative IP" with final GS, as in (17a).

(17a) ![IP notation]

(17b) ![IP notation]

The reason for this is that only the first IP in (17a) is actually marked as negative (by the marker kí). If final GS is a sensitive to the IP domain, and if each utterance is exhaustively divided into IP's according to the strict layer hypothesis (Selkirk 1984; Nespor and Vogel 1986), then the second and third IP's in (17a) must somehow be coindexed with the first IP for scope of negativity. Alternatively, as shown in (17b), the strict layer hypothesis can be discarded in favor of a self-embedded IP structure, where each IP contains the negative element. Neither of these seems particularly appropriate, given the scope facts in (10a). Since this utterance would constitute a single IP with a negative element in it, but since there is no final GS, there seems to be no escaping the necessity of referring directly to scope of negation in determining the insertion of final GS. Within the model of Selkirk (1986), (negative) final GS is either a mark of intonational phrasing or is inserted by a phonosyntactic rule having direct reference to syntax. In either case, final GS insertion precedes and has nothing to do with prosodic domains.15

3. Final GS in other West African languages

As pointed out at the beginning of §2, final GS insertion is widely attested in West African languages and, in some cases, is determined by conditions as varied as in Dagbani. In this section I shall briefly list a few such cases for comparative purposes.

3.1. Hausa (Chadic subgroup of Afro-Asiatic)

In Hausa (Newman and van Heuven 1981), GS is inserted before pause in declarative utterances if the prepausal vowel is: (a) short, or (b) long, if it either (i) belongs to a verb with an all H pattern, or (ii) is the first person singular possessive morpheme.

3.2. Fula (West Atlantic subgroup of Niger-Congo)

In Fula (Arnott 1970; McIntosh 1984), GS is inserted before pause in declarative utterances, roughly as follows: (a) on nouns, adjectives and verbominals; (b) on verbs in non-main clauses; (c) on stative, continuous and subjunctive verbs; (d) on pronouns containing a noun class agreement (e.g. most third person, but not first or second person pronouns). That is, there is no GS on determiners, numerals, pronouns without noun class agreement, adverbs, particles, and most verbs in main clauses and the imperative.

3.3. Gokana (Benue-Congo subgroup of Niger-Congo)

In Gokana (Hyman 1983), GS is inserted before pause in declaratives, roughly as follows: (a) on all nouns of the shape CV, most nouns of the shape CVfVj, all nouns of the shape CVfVj unless Vj is /i/, all bisyllabic noun stems except gö 'head'; (b) all verbs of the shape CV except du 'come,' no verb of the shape CVV except náá 'make,' bisyllabic verbs ending in -i (with H tone, but not when -i has M or L tone), never on verbs ending in -(C)á, always with verbs ending in causative -(C)É; (c) deictic 'this' does not take GS, while deictic 'that' does: té 'this tree' vs. té aá 'that tree.'

From the above we conclude that the insertion of final GS before pause in declarative utterances is widespread in West Africa, but that other phonological, morphological and syntactic conditions often complicate the picture. It is not always clear why these conditions have been imposed, and so we now consider in the final section some thoughts on what may have motivated such complex systems.
4. Historical implications

In the preceding sections we have seen that final GS may be conditioned by a number of disparate factors from all parts of the grammar. Since the common denominator appears to be “before pause in declarative utterances,” it is tempting to conclude that such GS’s result, historically, from the PHONOLOGIZATION of an intrinsic variation in the speech signal. In the case of prepausal vowels, the speaker is expected to cease voicing with the completion of the vowel. When GS is not present, this cessation is smooth, in many cases giving the impression of a final slight breathiness. On the other hand, when GS is present, the cessation of voicing is abrupt, giving the impression of a non-syllabic articulation, i.e., a final “consonant.” Presumably this is an available scenario for the development of extrinsic final GS. It may be the case, for instance, that the final GS of Tokyo Japanese started out more like the final GS of French or the final creakiness of British English (see §1). Thus, extrinsic final GS, originally variable, would come to be required before pause, perhaps with an additional requirement that the final vowel be short, as in Tokyo Japanese, or that it be long, as in Tepehua and Oromo (see note 3).

This historical source does not extend in an obvious way, however, to cases such as Dagbani, Fula and Gokana, whose additional morphological or syntactic conditions on final GS can be quite complex and appear arbitrary from a synchronic perspective. I would like to conclude this study, then, by considering the following two questions: 1) what is the historical source of such grammatically conditioned final GS’s? 2) when should final GS be treated as underlying, with an “inverted” rule deleting it in NON-pause environments?

In response to the first question, it should be noted that in Kwa languages located to the South of Dagbani in Ghana, there is considerable evidence that final GS’s are “traces” of lost segments. For example, Schachter and Fromkin (1968:204) cite dialectal variants of Akan (Volta-Comoe) such as the following:

(18) Akuapem/Asante Fante
   [jì]| [jìʔ]  ‘overflow’
   [hùmì]  [hùmʔ]  ‘breathe’
   [tòño]  [tònʔ]  ‘forge’

As can clearly be seen, the final GS of Fante (present only before pause) is a trace of a lost final vowel. Similarly, Snider (1986:136) presents the following dialect comparisons within the Guang subgroup of Volta-Comoe:

(19) Gonja Chumburung
   ka-wuìʔ  wuì  ‘skin’
   ku-fuìʔ  ki-fuì  ‘moon’
   e-pnìʔ  e-ŋari  ‘man’

Schachter and Fromkin (1968:83) also show that final GS can correspond to the loss of a final consonant, such as [w]. If one historical source of final GS is the “phonologization of pause,” then a second source is the “reduction” of a final segment. It is distinctly possible, in fact, that the GS found in affirmatives in Dagbani, with its phonological and morphological conditions, comes from this second historical source.

Having raised the possibility that final GS may be the reflex of an historical segment, either consonant or vowel, we now turn to the second question raised above: when should GS be set up underlyingly, with a rule of GS deletion? After deriving final GS from other segments, Schachter and Fromkin (1968:84) proposed the following rule of GS deletion:

(20) [+glottal constriction] −→ θ / _ X (where X is not a pause boundary)

To consider whether a similar analysis might be feasible in Dagbani, consider what Snider (1986:133-4) says concerning final GS in Chumburung: “I include it in the underlying forms... for two reasons: (1) it is distinctive, and (2) it blocks vowel coalescence.” As for the first point, Snider cites the Chumburung minimal pairs in (21):

(21) a. dà  ‘to hit’  b. ɗáʔ  ‘older brother’
    kò  ‘to fight’  kòʔ  ‘to decapitate’
    tè  ‘to sit’  tèʔ  ‘to pluck’

Unlike Dagbani, whose minimal pairs were seen in (4b), the minimal pairs in Chumburung may belong to the same form class, e.g., five out of the above six forms are verbs. Concerning the second reason Snider gives for underlying final GS, consider (22):

(22) a. /ɔ̄ saaŋ/ → t-*saanga  ‘to roast a sheep’
    b. /ɗɔ̄ / ɔ́  → d-*waasi  ‘to hoe soil’

In (22a), where the vowels /ɔ̄ / and /ə/ occur in immediate succession, we observe vowel coalescence. In (22b), however, where the same vowels are separated by the proposed underlying GS, vowel coalescence is blocked—instead, a [w] is observed in its place (suggesting, in fact, that GS may simply be an empty “C slot” or equivalent in underlying forms). It therefore seems that Snider’s analysis of
underlying GS is unavoidable and that final GS will have a different analysis in different languages, depending on such facts.

The Dagbani situation is one where all occurrences of GS can be predicted, though as we have seen, by a combination of factors. It is therefore unnecessary and undesirable to posit underlying GS's, especially when one considers that the GS-deletion rule that would be required (identical to the Akan rule in (20)) would delete GS when followed either by a consonant or a vowel. While the former is phonetically motivated, it is not clear why a GS should delete intervocally—in many languages, in fact, GS is inserted to break up just such a hiatus. We therefore conclude that GS is inserted by a complicated postlexical rule in Dagbani, as summarized in (16).

Since I opened this paper with a discussion of the different functions a GS potentially may fulfill, it is appropriate to end with a reconsider of function in the Dagbani case. Clearly GS is not distinctive in this language, if by distinctive we mean “unpredictable.” Since it requires a stem vowel, it could be argued to have a demarcative “acentual” function marking stems, or since it occurs exclusively before pause, it could be argued to have a demarcative “intonational” function marking pause, or perhaps the end of an intonational phrase, within declarative utterances. However, since so many other factors are required, these demarcative functions are imperfect, at best. In the affirmative, where the prepausal word must also be [-N], would we want to add that GS has the “morphological!” function of marking non-nominals? It seems unlikely, in fact, that GS came in with a distinct function (or functions) in mind.

Which brings us to the marking of prepausal GS under the scope of negation. Here one might claim that GS has the “syntactic” (semantic?) function of marking negation. It does not seem far-fetched to label this GS as a negative intonation marker, just as it is reasonable to identify final GS as a declarative intonation marker. An intriguing question, however, is how the negative GS may have come into being. Many languages, including Hausa, have a (second) negative marker at the end of the negated clause, from which a GS could have derived, historically, in Dagbani. While the multiple occurrences seen at the end of each disjunct in (12b) could conceivably have been derived, individually, from this hypothetical (segmental) negative marker, it seems impossible that the multiple occurrences of GS in (13b) could be direct reflexes of the marker. Assuming that it had a shape such as [ba], for instance, it would seem very odd that multiple [ba]’s would ever have been required in the historical antecedent to (13b), where a pause is placed essentially after every word. In fact, I would claim that the same would be true in (13b) if negation were marked, say, by -k rather than by -J. In other words, I believe that despite the complexity of the system, GS is subject to a “prosodic” interpretation that is not available for either -k or -ba and hence, unlike

the latter, can be generalized to “unnatural pauses” such as in (13b). In other words, we must allow for GS to have the same potential functions as other prosodic features: tone, stress, duration. What these prosodic features have in common, of course, is that they lack a supralaryngeal articulation. Accordingly, they can be superimposed or produced in parallel with any consonant or vowel articulation with which they are physically compatible. To develop further the opening quotation from Firth (1948), we can say that speakers may interpret GS either “paradigmatically” in opposition to other consonants of a phonological system, or “syntagmatically” as a timing gesture affecting the laryngeal node. Prepausal GS is thus “prosodic” in a way that supralaryngeal consonants cannot be.19

NOTES

1 Throughout this paper I will be using the term “glottal stop” (or GS) to refer not only to actual glottal stops, where closure of the vocal cords is complete, but also to glottalization, where closure may not be complete. I am hence interested in the phonology of final glottality per se, independently of its exact phonetic realization, which may vary according to speaker, style, and/or language.

2 I have omitted from consideration discussion of the so-called culminating function, which is met when a morphological property identifies the number of units or domains (e.g. words) present in a string. Originally applied to characterize languages with so-called free stress-accents, it is potentially applicable to GS as well, e.g. Merlan (1982:183) says of Mangarayi, an Australian language: “No word contains more than one glottal stop,” excepting certain reduplications. It is not clear if this function is ever relevant to final GS.

3 Perhaps it should be noted at this point that prepausal GS is often limited to cases where the final vowel is short, as in Tokyo Japanese and (with some exceptions) in Hausa. In other languages such as Tepelu (Jim Watters, p.c.) and Oromo (Paul Newman, p.c.), prepausal GS is found only when the final vowel is long: in both languages, the final long vowel will surface as a short vowel followed by a GS, while a final short vowel will be devoiced.

4 As stated in note 1, we need not be concerned with whether final glottality involves complete closure of the vocal cords (i.e. GS) or not (e.g. creak).

5 The data come from the speech of Mr. Abdul Saed, from Tamale, Ghana, who served as informant during a field methods course in Spring semester, 1988, at the University of Southern California. I am grateful to Mr. Saed, who also met extensively with me subsequently, and also to the members of the field methods course who provided helpful comments and stimulation throughout our joint study of Dagbani phonology and grammar.

6 These verbs have the less frequent alternants [ba, tumi, carj, soj], which also do not acquire a final GS, since the final [i] is not a stem vowel.

7 The second mora of each vowel is unambiguously part of the stem, not a suffix.
demonstrate that reduplication in this language is accomplished by a two-syllable prefix, e.g. bātu ‘stone’ becomes bātu-bātu ‘small stone(s),’ gōlā ‘sugar’ becomes gōlā-gōlā ‘sweets’ and so forth. Where the base noun has itself more than two syllables, e.g. mānāra ‘towel’ and bālāo ‘hat,’ we obtain mānāra-mānāra ‘sort of towel’ and bālāo-bālāo ‘toy hat.’ In these cases the GS is the sign of truncation, i.e. hypothetical ‘mānāra-mānāra becomes mānāra-mānāra. Could this GS be related to the GS “marking” final segment deletion in the Volta-Congo languages?  

The alternative is to see GS as being “phonologized” preferentially in the negative. This may also be plausible, given that lots of West African languages highlight negation prosodically, e.g. “In various languages an extra-high tone occurs, contrastively, but limited perhaps to the negative and a few other places.” (Pike 1970:97). For example, in Gwari, “In negative sentences the whole level of the tonal contour is raised, such that lower-mid becomes mid, mid becomes high and high becomes super high tone.” (Hyman and Maga 1970:118). In addition, Hyman and Waters (1984) and Manchee (1983) document the widespread natural class formed by negatives and imperatives, which are said to be “intrinsically focused.” It is interesting in this connection to cite the case of Lahu, where imperatives acquire a final GS, which Maisoff (1973:353) considers an imitation.  

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Not All Utterances Are Sentences
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1. Introduction

This paper is meant to address the publicized theme of this conference: “Sentence-Based Grammars: Pro and Con”. It does not argue against sentence-based grammars or sentential syntax, it assumes them. Rather, it addresses the issue of whether the category sentence (S) is the designated start symbol of a grammar. “Designated start symbol” is a concept in early generative grammar that was derived from formal language theory. It is the category symbol in a grammar that is distinguished by two properties:

1. Every string in the language generated by the grammar is of that category.
2. It is not recursive.

In the body of this paper, I will address the issue of whether there is a designated start symbol and, if so, what it is. Section 2 sketches out the history of S as designated start symbol. Section 3 presents syntactic arguments that there are certain utterances that are not S's at any level of representation. Section 4 argues for the existence of another category, Utterance, as designated start symbol on the basis of semantic considerations. Section 5 presents other aspects of Utterance's behavior. Finally, section 6 summarizes the conclusions of this work and presents arguments for modifying the conclusions of Sections 4 and 5.

2. S as Designated Start Symbol

In the earliest days of transformational grammar, the category S was the designated start symbol. This can be seen from the following quotations:

1. “S is the unique prime that represents every grammatical string.” (Chomsky 1955, Section 50.2)
2. “...all recursions drop from the kernel grammar.” (Chomsky 1955, Section 105.2)

In fact, not only was recursion of S eliminated from the “kernel grammar” (or, as we would now say, “from the base”), there was also no recursion for NP, as well. Since there is clearly superficial recursion in English and other natural languages, recursion had to be placed in another component of grammar, and, in fact, it was reserved to the transformational component. This was done by two types of transformations:

Generalized transformations which embedded basic sentences—“kernel sentences” as they were called at the time—one inside the other, inserting the appropriate complementizers, etc. (Chomsky 1955, Section 91.1f)

Nominalization transformations which transformed underlying sentences into derived nominals. (Chomsky 1955, Section 99.6f, Section 107f; Lees 1960)

Gradually recursion was placed back in the base. The first move was the elimination of generalized transformations (Chomsky 1965) and (1966, especially p. 633) Generalized transformations were eliminated for several reasons; chief among them