

That French h aspiré (H) sets itself off from the preceding word is a basic observation that appears in the literature in various guises. Morin (1974: 87f) and Schane (1978) propose that H words are vowel-initial and bear a syllable boundary to the left of H in the lexicon. This syllable boundary is cannot be altered during phonological computation, so that the initial vowel of H words will always be syllable-initial (also Tranel 1979). Cornulier (1978) argues that h aspiré induces a "separation" and is marked for this property in the lexicon. In the same way, Côté (2008: 92) discusses "the basic intuition that h-*aspiré* words maintain a stronger separation between them and the preceding word" (italics in original).

The talk is about two things: a better understanding of the empirical situation regarding H-induced glottal stop insertion on the one hand, and the characterization of the domain that is at work on the other.

It is well-known that H words generate a glottal stop when occurring after a consonant (Dell 1973: 186, 262 note 85, Tranel 1981: 310f, Encrevé 1988: 198ff). Hence C+H *quel [...lʔe...]* *hêtre* "which beech" occurs with, but V+H (*un joli [...iɛ...]* *hêtre* "a pretty beech" without glottal stop. It is also well known that glottal stop insertion is optional: not all instances of *quel hêtre* will have it. As far as I can see, there is no empirical study regarding this optionality, or one that tries to assess the intuitions of speakers that it is more frequent or probable after consonants than after vowels. Or indeed, whether it occurs after vowels at all: is *un joli [...iʔe...]* *hêtre* with glottal stop ill-formed?

The talk reports results from a production experiment where French natives were asked to pronounce a sequence of words that was shown on a screen. The audio was then manually evaluated by a trained linguist for the presence or absence of a glottal stop. A first experiment involved H nouns (n=12), a second one H verbs (n=12). In both cases, relevant contrasts included the following. 1) X+H (various items followed by H): C+H (*sept hêtres, il hache*), LC+H (LC = liaison consonant, unpronounced, *un grand hêtre, nous hachons*), V+H (*un joli hêtre, tu haches*). 2) X+V: C+V (*sept êtres vivants, il arrive*), LC+V (*un grand évier, nous arrivons*), V+V (*un joli évier, tu arrives*), 3) X+C: CL+C (*un petit beignet, nous partons*).

Since it is notorious that H words (which appear as such in the dictionary) may or may not have an actual H in the lexicon of individual speakers (*le haricot > l'haricot* with many speakers), a pretest evaluated the status of H words involved in the experiment in the personal lexicon of participants by asking them whether they are preceded by the full or elided article (would you say *le hêtre, l'hêtre*, or are both ok?) or 1sg pronoun (*je hache, j'hache*, or both ok). Participants were 25 French natives (11 below, 14 above age 40) for the noun experiment, 32 natives (all below age 30) for the verb experiment.

A first result evidences the high lexical, inter- and intra-person variability of H. In the pretest, for *harceler* 2 out of 32 participants responded *je harcèle*, while for *hair* 29 out of 32 said *je hais*, the 10 other H verbs coming in anywhere between these extremes. *Je* was chosen for 2 verbs out of 12 by P17, against 11 out of 12 by P14, other participants coming in anywhere in between. A second result is that these pretest judgements are not reliable: in actual production, P13 for example pronounced *vous [z] hissez la voile* with liaison, while they chose *je hisse* in the pretest. The reverse is just as frequently observed (pretest *j'*, but no liaison in production). The representational interpretation is to say that H is variable in the lexicon, where an H-initial form competes with an H-less form. But as will be argued below, a computational interpretation is more convincing: based on a stable H in the lexicon, what is variable is the domain created by the H which may (no liaison) or may not (liaison) set its word off in a computational domain of its own.

The next observation concerns liaison, which is supposed to be obligatory within DPs, such as Adj+Noun or DET+Noun. In the experiment, liaison rate was 100% in the latter configuration (250 out of 250 with indef. pl. art. *des* : *des examens*), but only 55% in the former pattern (136 out of 246: *un grand évier*) (difference of course significant). The Adj+Noun pattern also shows variation: lexical (*petit* produced 100% liaison, *faux* only 24%, the other LC words coming in between these scores) and inter-speaker (P5 produced liaison for 10 out of the 12 LC words, P25 only for 1 out of 12, the others ranging in between) (intra-speaker cannot be measured since there was only one pass for each token).

Note that in the verb experiment, personal pronouns with a liaison consonant (*nous, vous*) behave like DET in the noun experiment: they show 100% liaison (*nous [z] arrivons*). The generalization thus seems to be that function words (DET, PRO) do justice to the reputation of making liaison obligatory, while content words (Adj) do not have this status (anymore).

Again, a lexical analysis (speakers have lost the liaison consonant, or are currently losing it) is not convincing since the categorical split is about major category: Adj vs. DET, PRO. Rather, the contrast indicates that DET+Noun / PRO+Verb form a single domain no matter what [DET+N] / [PRO+V] (thus phonological computation always produces liaison), while the syntactic relationship of Adj+Noun is more distant, allowing for a phonological computation of both items in the same [Adj+N] (liaison present) or in different [Adj]+[N] (liaison absent) domains.

Results regarding H-induced glottal stop insertion. The glottal stop occurs in *all* environments, but more often when word 2 is H-initial, and within these still more often when word 1 is C-final: V+V (*tu attends*) produces a glottal stop rate of 7,6%, which grows to 32,3% in V+H (*tu hais*) and reaches 47% in case of C+H (*il hait*). The same goes for the 2% rate of C+V (*il aime*) compared with 47% of C+H (*il hait*). All differences mentioned are statistically significant. Also note that all data at hand are based on verbs (PRO+V), i.e. with no interference from domain separation due to morpho-syntax.

The intuition-based literature on H and glottal stop is thus confirmed: 1) yes H generates glottal stops; 2) yes the phenomenon is sensitive to the strong position, i.e. more glottal stops occur after consonants (C+H) than after vowels (V+H). The experiment also quantifies the optionality mentioned in the literature: it is not the case that glottal stops never occur, or are agrammatical, in V+H; or that they are always present, or obligatory, in C+H. Glottal stop insertion in French is a gradient, not a categorical phenomenon.

New evidence that is not mentioned in the literature is the presence of glottal stops in absence of H, though (V+V). What may be their origin? I submit that they are the trace of production planning domains in the sense of Wagner (2012), Tamminga (2018), Kilbourn-Ceron (2017) and Wagner et al. (2020). Production planning windows define the stretch of the linear string for which production is prepared in one go. They are variable (across speakers, individual speech acts etc.) and defined by a number of factors that include morpho-syntactic information, semantics (Selkirk's 1984 sense unit), surprise (incongruent meaning causes a boundary), word length and word frequency.

That is, a glottal stop occurs in V+V (*tu attends*) if production planning has segmented both words in two distinct domains [tu] [attends...], but does not in case both belong to the same domain [*tu attends*]. Glottal stops are thus inserted domain-initially (into the empty onset of V-initial words). Clear evidence that glottal stop insertion indeed occurs domain-initially comes from the verb experiment: a glottal stop precedes stimuli beginning with *il* and *elle* (*?il arrive*), i.e. in utterance-initial position, in 75% of trials.

Recall that the classical literature mentioned at the outset of the abstract has identified the virtue of H to separate its word from the preceding. Production planning domains and the experimental evidence reported are a close match of this intuition. Note that H-created domains of course cannot be morpho-syntactic in kind (phases, cycles) since morpho-syntax has no clue what an H is.

This means, in sum, that the glottal stop in French occurs in two contexts: domain-initially and in post-consonantal position – that is, in the Strong Position (Coda Mirror, Ségéral & Scheer 2008). In post-consonantal position, we are sure that there is no domain boundary preceding H since the preceding C is visible to the phonological computation but would not if there were a boundary.

Finally, the experiments conducted also confirm Encrevé & Scheer's (2005) observation that H-induced glottal stop insertion not only occurs after pronounced (C+H, *il hache*), but also after unpronounced (CL+H, *nous hachons*) consonants. While the glottal stop rate of both C+H (47%) and CL+H (45%) is significantly higher than the one of V+H (*tu haches*, 32%), the difference between a preceding pronounced (C+H, 47%) and unpronounced (CL+H, 45%) consonant is not statistically significant. In other words, H-induced glottal stop insertion is sensitive to any preceding consonant, pronounced or not. This is evidence for the presence of liaison consonants at the right edge of words (where they are spelt), even when they are not pronounced (floating consonants in the regular autosegmental analysis), against analyses such as Côté's (2005).

The phenomena involved (liaison, glottal stop insertion) are phonological in kind since they are sensitive to syllable structure. Data and analysis presented involve domains of two distinct origins: morpho-syntactic (cycles, phases) and production planning. But phonological computation of course cannot make the difference: it is bound by any domain. The relationship between the two kinds of domains appears to be of the Russian doll type: production planning may further subdivide phases (V+V with glottal stop, H setting its word off), but in some cases has no word to say (PRO+V produces 100% liaison). As is well known, computational domains are alternation-specific (in English, l darkening is bound by the word, but t-flapping is not), and this is also the case here: within the same domain PRO+V,

production planning may create domains relevant for glottal stop insertion, but not for liaison.