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*Guttural deletion in loanwords**

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Among 4,499 segmental malformations found in English loanwords in three large corpora of French, the laryngeal /h/ is the only segment that is never adapted, i.e. replaced by another segment. We suggest that the systematic deletion of /h/ in French follows from the fact that, phonologically, French, like Portuguese and Italian, does not employ the Pharyngeal node, the articulator that characterises gutturals. This prevents English /h/ from being handled phonologically (deleted or substituted) in those languages. The non-availability of the Pharyngeal node also explains systematic deletion of the pharyngeal and laryngeal gutturals in Arabic loanwords in French. In contrast, English /h/ is adapted by languages employing the Pharyngeal node phonologically, such as Spanish, Bulgarian, Catalan, Mandarin Chinese, Greek and Russian. Likewise, the availability of the Pharyngeal node in Fula and English allows the adaptation of Arabic pharyngeal and laryngeal gutturals in Fula, and non-glottal gutturals in English.

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1 Introduction

This article focuses on the special behaviour of pharyngeal and laryngeal gutturals in loanwords.[1] More specifically, it is concerned with explaining the systematic deletion of the gutturals /ħ ʕ h ʔ/ in languages such as French. Normally, foreign sounds are adapted to the closest sounds of the borrowing language. Deletion is extremely rare (669 out of 19,193 cases, i.e. 3·5 % of the cases in our database, as shown in the statistics in Table I below). However, in some cases, it seems that there is nothing close enough. In other words, it seems there is a limit on the distance between two segments for purposes of adaptation. Beyond that limit, the foreign segment is deleted (that is, unrealised), instead of being adapted. We believe this is what happens to pharyngeal and laryngeal gutturals in languages such as French.

The distance between a native and a foreign segment also seems to be a relevant criterion in second language acquisition (L2). Based on perception experiments carried out on (mainly Japanese) second language learners, Brown (1997) shows that only sounds that make use of features active in the first language (L1) can be mastered in L2 acquisition. Thus, Japanese learners of English can easily distinguish /v/ from /f/, although /v/ is not in the Japanese inventory, because Japanese itself employs the Labial node and the voiced/voiceless distinction. This is evident from the fact that Japanese has both /p/ and /b/ in its own inventory. However, Japanese learners cannot adequately master the distinction between /s/ and the English interdental /θ/, because, Brown maintains (1997: 227), Japanese has no [distributed] sounds in its inventory. In other words, Japanese does not employ the feature [distributed].

In line with Brown's claims, LaCharité & Prévost (1999) predict that Francophone learners of English will show a clear distinction in their acquisition of English /ŋ/ *vs.* /h/. This is because /ŋ/ is simply a novel combination of features already active in French – which has both nasals (/m n ɲ/) and dorsals (/k g/), though not a dorsal nasal – while the guttural /h/ employs an articulator not used distinctively in French. Although LaCharité & Prévost's results indicate that Brown's position

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[1] The term GUTTURAL requires some clarification, since it is used with various meanings. As noted by Trask (1996), guttural is sometimes used synonymously with VELAR, especially in philological work. It is also often used to refer to the class of consonants articulated at the back of the mouth, i.e. involving the throat. This includes velars, uvulars, pharyngeals and laryngeals. More recently, notably in work by McCarthy (1991, 1994), guttural is used for the class of uvulars, pharyngeals and laryngeals. We do not intend to debate the application of the term, though we will present arguments from loanword adaptation for including velar fricatives among the class of gutturals. For the present, we continue to use the word guttural in the more recent sense of the term (see McCarthy 1991, 1994).

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may be too strong, since non-native sounds and distinctions are often ultimately learned, there is no doubt that they pose particular difficulty in L2 acquisition. In the case of Francophones learning English, /ŋ/ is easily mastered while /h/ is notoriously problematic.

The difficulty for Francophones in learning /h/ is parallelled in the adaptation of English loanwords in French. Among 4,499 segmental malformations found in English loanwords in three large corpora of French, two of Quebec French (QF) and one of Parisian French (PF), the laryngeal /h/ is the only segment that is never adapted, i.e. replaced by another segment (general and detailed statistics are presented in Tables I and II, respectively). Thus, while English sounds are systematically replaced by a native French sound, /h/ is systematically deleted. To compare, English /ŋ/ is adapted to /ɲ/ in the three French corpora of loans (e.g. English *punk* [pʌŋk] → French [pɔɲk]) in 319/327 cases, 97·6 %, while /h/ is deleted in 163/163 cases (100 %), e.g. English *hold up* [hoɬdʌp] → French [_oldɔp]. As targeted research into the behaviour of the guttural /h/ continued, leading us to look into the treatment of several other gutturals in Arabic words borrowed into French, we found that the pharyngeal gutturals /ħ/ and /ʕ/ and the laryngeal guttural /ʔ/ are also systematically deleted in French, and the other languages that lack gutturals.

In the spirit of Brown (1997), we suggest that the systematic deletion of the laryngeal and pharyngeal gutturals in languages such as French is due to the fact that, phonologically, those languages do not employ, i.e. do not have, the Pharyngeal node – the articulator node that characterises gutturals. This prevents the Pharyngeal node of /ħ ʕ h ʔ/ from being handled phonologically (deleted or substituted) at the moment of loanword adaptation to produce a licit native sound. The non-adaptability of the Pharyngeal node is central here since it leaves the segment without a Place node (even at the phonetic level), and thus prevents the phonetic realisation of the guttural (unless it is imported). In this article, we formalise the acceptable distance between two segments for purposes of adaptation in terms of the phonological primitives available in L1 and L2. We call our proposal the Non-availability Hypothesis, which is formally introduced in §2. The Pharyngeal node in French – along with tones, lexical stress and other features – constitutes an unavailable primitive at the phonological level. This is not to say, however, that an unavailable primitive always blocks the realisation of a foreign segment, be it a guttural or not. As addressed in §6, it all depends on what the non-available primitive deprives the foreign segment of at the moment of its adaptation, and the segmental inventory of the borrowing language.

The article is organised as follows: the problem, theoretical framework and working hypotheses are presented in §2. §3 presents the results of a test that we ran to show how the English laryngeal /h/ is, on the one hand, adapted by languages that have a velar or uvular fricative in their own segment inventories (such as Spanish, Bulgarian, Catalan, Mandarin Chinese, Greek and Russian) but, on the other hand, systematically

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deleted in languages that lack such segments (such as Italian and Portuguese). §4 compares the behaviour of English /h/ and that of pharyngeal and laryngeal gutturals in Arabic loanwords in French. The behaviour of Arabic pharyngeal and laryngeal gutturals is further pursued in §5, this time using Fula and English, languages that each have a limited guttural inventory of their own. §6 is dedicated to the formal representation of the adaptations observed in the preceding sections. There, we also encode in a formal principle the Non-availability Hypothesis presented in §2. Finally, in the light of the results shown in §§4 and 5, we suggest, in §7, that the English laryngeal /h/ has a specified Pharyngeal node, even though there is no laryngeal contrast in English. This position differs from that of Rose (1996), according to whom a laryngeal is specified for a pharyngeal articulator only if the laryngeal is opposed to at least one other guttural in the language.

2 Theoretical framework and hypotheses

A lexical loan is defined as in Paradis & LaCharité (1997: 391), which is, in turn, based on the definition used in Poplack *et al*. (1988).

(1) *Lexical loan*

An L2 word or compound which is incorporated into the discourse of a borrowing language, which has a mental representation in that language (in contrast to code-switches, see Myers-Scotton 1992) and which respects at least the peripheral phonological constraints of the borrowing language.

On the basis of sociolinguistic studies (see, among others, Haugen 1950, Grosjean 1982, Poplack *et al*. 1988) and studies on the phonological adaptation of loanwords (see Paradis & LaCharité 1997, LaCharité & Paradis 2000, Paradis & Prunet 2000, etc.), we assume here that loanwords, at least non-proper name loanwords, are introduced into the borrowing language and adapted by bilinguals, who have access to the codes of both the source and borrowing languages.[2] Bilinguals phonologically adapt loanwords, especially when speaking with monolinguals. Clearly, this aids communication. Even if monolinguals are in large measure responsible for

[2] By BILINGUAL we do not necessarily mean BALANCED BILINGUAL . However, the more contact a bilingual has with the source language, the more s/he will borrow. As noted by Poplack *et al*., 'the agents of introduction and, to some extent, transmission of borrowings within the community are more likely to be bilinguals or those in direct contact with the donor language and/or culture' (1988: 48); 'thus we can confirm that highly bilingual speakers are importers of lexical innovations, as evidenced by their preference for nonce and unattested borrowings' (1988: 85). Haugen (1950: 210) writes 'As early as 1886 [*sic*], Hermann Paul [1880] pointed out that all borrowing by one language from another is predicated on some minimum of bilingual mastery of the two languages. For any large-scale borrowing a considerable group of bilinguals has to be assumed. The analysis of borrowing must therefore begin with an analysis of the behavior of bilingual speakers'.

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the diffusion of loanwords throughout the community, they are not generally responsible for the ACTIVE (on-line) phonological adaptation of loanwords. For the most part, monolinguals use only loanwords from which sounds and structures not tolerated by the borrowing language have already been removed.[3]

When a lexical loan is first introduced into a language, some of its sounds may be modified to suit the phonological constraints of the borrowing language. We refer to such modifications as adaptations when they result in the substitution of one (generally native) sound for a foreign one (a phoneme, a tone or a stress pattern). Adaptation also refers to the addition of a sound, which normally occurs so that a sound sequence may be syllabified according to an acceptable native pattern. The term DELETION is used when a foreign segment is lost entirely. The adaptation of foreign sounds is exemplified in the following French loanwords found in Fula, a West African language, in Kinyarwanda (Kin.) and Lingala (Ling.), two Bantu languages spoken in Rwanda and the Congo, respectively.

(2) *Examples of the adaptation of foreign sounds in borrowed words*

a.	Fr. *chauffeur*	'driver'	[ʃofœr]	→ Fula	[sofeer]	(Fula = */ʃ/)
b.	Fr. *arrêt*	'stop'	[arɛ]	→ Kin.	[are]	(Kin. = */ɛ/)
c.	Fr. *magie*	'magic'	[maʒi]	→ Ling.	[mazi]	(Ling. = */ʒ/)

Within the framework of the Theory of Constraints and Repair Strategies (henceforth TCRS), proposed by Paradis (1988, 1990, etc.) and further developed in Paradis & LaCharité (1993, 1997), Béland & Paradis (1997), Paradis & Prunet (2000), etc., the adaptations exemplified in (2) are caused by constraint violations, here a prohibition against the non-anterior coronal fricatives /ʃ ʒ/ in both Fula and Lingala, and against the lax vowels /ɛ ɔ/ in Kinyarwanda. Such constraints result from negative responses to options offered by Universal Grammar (UG). These options, also called parameters, are illustrated in (3).

(3) *Parameters*

a.	Non-anterior coronal fricatives?	French: YES Fula and Lingala: NO (constraint)
b.	Lax vowels?	French: YES Kinyarwanda: NO (constraint)

The violation of a constraint, such as that caused by the presence of a

[3] For us, tolerated segments are peripheral, which is to say they are foreign sounds (phonemic or not) that are imported into the borrowing language, as for example the English /ʤ/ in French (e.g. English *job* [ʤɑb] → French [ʤɔb]) (see Itô & Mester 1995, Paradis & Lebel 1994, Paradis & LaCharité 1997, among others, on the question of imports and the periphery). We also refer to tolerated segments as non-adaptations.

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foreign segment in a borrowed word, triggers a repair strategy, defined in (4).

(4) *Repair strategy*

A universal, non-contextual phonological operation that inserts or deletes phonological material to satisfy a violated constraint.

Paradis & LaCharité (1997) and Paradis & Prunet (2000), among others, demonstrate that TCRS's principles to a great extent predict the nature of adaptations and the low rate of segment deletions seen in loanwords. In other words, the type and precise target of a repair strategy can be foreseen in the vast majority of cases.

Our observations are based on data presented in Table I, which comprise 7,015 English and French loanwords (almost exclusively non-proper name loanwords) in nine different languages or dialects. The corpora include English loanwords in Quebec City French, Montreal French, Parisian French and Mexican Spanish, and French loanwords in Moroccan Arabic, Kinyarwanda, Lingala, Fula and English.[4] To date, our database contains a total of 20,942 segmental, syllabic and metrical malformations (22,456 malformations, if stress malformations are included). Among these, 19,193 (14,861 segmental and 4,332 syllabic or metrical) malformations are relevant to phonological analysis, i.e. their adaptation is not distorted by factors such as orthography or analogy, and they do not constitute missed targets (e.g. French *crêpe suzette* [kʁɛpsyzɛt] pronounced [kɹɛp] by one consultant in our Canadian English corpus). To our knowledge, our loanword database is the most extensive that has been studied from a phonological point of view to date.

The loanwords in the database were gathered partly from spontaneous discourse by native speakers of each of the borrowing languages. For reasons of efficiency and feasibility, a large number of loanwords were gathered also from documents. However, all loanwords were verified by (generally three and sometimes four) native consultants. We call the pronunciation of a loanword by a consultant a FORM, which is the concrete realisation of an abstract entity, the loanword. Our analysis is directly based on forms, not loanwords *per se*. This distinction is important because a given consultant may not know every single loanword, and all consultants may not pronounce a given loanword in exactly the same way. Thus, our analysis takes all the variant pronunciations of our consultants into account and disregards any loanwords that are unknown by all of them. Forms were elicited through definitions, paraphrases, fill-in-the-blank phrases, pictures or drawings. The loanwords were not pronounced by the interviewers. To avoid the possible influence of orthography, the words were not presented in their written form either, though data

[4] These corpora have been constructed under the auspices of *Project COPHO* (a project on constraints in phonology), directed by Carole Paradis and Darlene LaCharité.

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corpora	loanwords	forms	malformations[5]	malformations relevant to phonology	adaptations	deletions	non-adaptations	orthographic influence
				English loanwords				
Quebec City French	948	2,412	2,176	2,080	1,659 79·8%	79 3·8%	342 16·4%	67 3·1%
Montreal French	948	2,245	2,035	1,974	1,431 72·5%	70 3·5%	473 24·0%	40 2·0%
Parisian French	300	450	479	445	364 81·8%	18 4·0%	63 14·2%	34 7·1%
Mexican Spanish	1,045	1,514	1,881	1,649	1,034 62·7%	1 0·1%	614 37·2%	164 8·7%
				French loanwords				
Moroccan Arabic	1,127	2,675	4,234	3,941	3,071 77·9%	351 8·9%	519 13·2%	46 1·1%
Kinyar-wanda	756	2,130	4,639	4,208	4,120 97·9%	62 1·5%	26 0·6%	157 3·4%
Lingala	672	1,917	3,897	3,571	3.378 94·6%	31 0·9%	162 4·5%	221 5·7%
Fula	545	1,036	858	814	741 91·0%	57 7·0%	16 2·0%	44 5·1%
Canadian English	674	1,667	743	511	431 84·3%	0 0·0%	80 15·7%	7 0·9%
total (9 corpora)	7,015	16,046	20,942	19,193[6]	16,229 84·6%	669 3·5%	2,295 11·9%	780 3·7%

Table I
French and English loanwords from *Project COPHO*.

analysis has revealed that orthography has very little influence on the pronunciations of known loanwords (only 780 cases out of 20,942 segmental and syllabic malformations, i.e. 3·7 %, show the influence of orthography).

[5] This includes segmental, metrical and syllabic malformations. These statistics are from our database of loanwords dated December 2000.

[6] The statistics for the French corpora differ somewhat from those cited previously because further research has led us to exclude English [ɹ] and [ɬ] from the phonological malformations. We consider the adaptations of these segments to be purely phonetic. Segmental malformations now include only segments whose substitution involves a change of PHONEME in the borrowing language (e.g. /θ/ → /t/ in QF but not [ɹ] → [ʁ]/[ʁ] or [ɬ] → [l]).

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Our consultants, as well as their parents, are native speakers of the borrowing language, with little knowledge of the source language, to avoid the possibility of code-switching. Responses were taped and subsequently transcribed in IPA by a research assistant knowledgeable in the borrowing language. Transcriptions were checked by a second, and in some cases a third research assistant before being entered into a computerised database, using HyperCard.

We place great importance on using loanwords that are as recent as possible because we want to be sure of the phonological form of the word at the moment of its entry into the borrowing language. The older the loanword, the more difficult it is to know for certain (a) how the loanword was pronounced in the source language and (b) what the active native phonological processes in the borrowing language – which can affect the phonological shape of the loanword – were at the time the loanword was borrowed. Furthermore, as highlighted by Cannon (1998), old borrowings are often indirect borrowings, i.e. words that were introduced into L1 from L2 via a third language, which is not always identified. Such borrowings are irrelevant to the study of phonological loanword adaptation, because we do not know which language's constraints were at work in adapting the borrowing. This is why none of the loanwords in our corpora is more than 200 years old and most are much more recent. This is notably true of French loanwords in Moroccan Arabic, Kinyarwanda, Lingala and Fula, given that Morocco, Rwanda, the Belgian Congo and the Futa Toro region of Senegal and Mauritania were not colonised by the French until the beginning of the twentieth century. For Mexican Spanish, pre-1950 loanwords were excluded, because later loanwords are sufficiently numerous to provide a useful corpus. Most of the English borrowings of our French corpora were also introduced after 1950.

The figures in Table I show that a foreign (i.e. ill-formed or illicit) segment is adapted in 84·6 % of the cases (16,229/19,193), if we take into consideration NON-ADAPTATIONS, which are foreign sounds imported as is into the borrowing language. Non-adaptations account for the fate of 11·9 % (2,295) of the malformations relevant to phonology in our corpus. If we exclude importations, which are irrelevant to the present study, then foreign segments are adapted, as opposed to deleted, in 96 % of the cases (16,229/16,898 malformations). Ulrich (1997) reports a very comparable rate: 373 adaptations out of 377 malformations (98·9 %) found in French and English loanwords in Lama, a Gur language spoken in Togo. Deletion of a segment is rare; in our corpus, it occurs in only 3·5 % of the malformations (4 % if one excludes non-adaptations), which is to say 669/16,898 malformations found in 16,046 forms. The only systematic deletion is of the laryngeal /h/, on which we will focus, and violations of the THRESHOLD PRINCIPLE in (6), which will be briefly addressed below. Ulrich's corpus also shows a very low rate of segment deletion (1·1 %).

The high rate of adaptation, compared to the very low rate of deletion, is attributed to the fact that repair strategies, which are responsible for the

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adaptation of foreign elements in loanwords, obey the PRESERVATION PRINCIPLE, given in (5).

(5) *Preservation Principle*
Segmental information is maximally preserved, within the limits of constraint conflicts.

A conflict may arise between the Preservation Principle and the Threshold Principle, given in (6). The Threshold Principle limits the cost that a language will pay in order to preserve segmental information.

(6) *Threshold Principle*
a. All languages have a tolerance threshold to segment preservation.
b. The tolerance threshold of a language limits the procedural weight (i.e. the number of steps) a repair is allowed within a constraint domain (see Paradis 1996 on constraint domains).
c. The number of steps in a repair cannot exceed the canonical number pattern recognition capacity of an adult.[7]

This principle has been found to explain the segment deletions in Fula, Lingala, Kinyarwanda and Moroccan Arabic. Malformations requiring the application of more than two repair strategies (three in Lingala) lead to segment deletion. These cases are relatively rare because they require a combination of two factors: the presence of a malformed (i.e. foreign) segment, contained within what is, from the point of view of the borrowing language, a malformed syllabic or metrical constituent. An example is the French word *tuyau* [tɥijo] 'pipe', which is realised as [tijɔ] in Fula, instead of *[tiwijɔ], the form expected if deletion had not applied. The glide /ɥ/ is deleted because in Fula it is an illicit phoneme which further constitutes part of an unsyllabifiable sequence. Indeed, word-initial consonant clusters (branching onsets), as well as rising sonority diphthongs, are prohibited in Fula. Paradis & LaCharité (1997) and Paradis & Prunet (2000) show that the procedural weight involved in repairing a double malformation such as that in *tuyau* is too heavy (three and, in some cases, four repair strategies). Languages prefer to delete one of the segments of the cluster, usually the illicit one.[8] Otherwise, in a non-branching onset, French /ɥ/ is adapted to [w] ([ɥ]), as in partially adapted

[7] Our formulation of the Threshold Principle does not imply serial counting (one, two, three, …) *per se*. Instead, we conceive that the number of steps is canonically, i.e. globally, established. Canonical pattern recognition is also called SUBITISATION. According to Wynn (1990: 191), young children (including newborns) can recognise canonical number patterns corresponding to *two* and *three*, while adults can subitise numerosities of up to four or five.

[8] The notion of a double malformation within the scope of a given constraint domain must not be confused with the number of malformations within a given loanword. A loanword may contain several malformations, but deletion of a malformed segment occurs only if it is embedded in another malformed syllabic or metrical constituent (see Paradis & Béland (to appear) for segment deletions involving metrical constituents). It is the number of malformations within a given constraint domain (for a discussion of constraint domains, see Paradis 1996), not the number of malformations *per se* that is relevant.

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	Quebec City French	Montreal French	Parisian French	*total*
loanwords containing /h/	29	29	11	34 *
forms	77	78	18	173
relevant malformations	77	78	18	173
non-adaptations of /h/	0	10 (12·8%)	0	10 (5·8%)
relevant cases excluding non-adaptations	77	68	18	163
adaptations of /h/ **	0	0	0	0
deletions of /h/ **	77 (100%)	68 (100%)	18 (100%)	163 (100%)

Table II

Behaviour of /h/ in English loanwords in French.
(*Many of the loanwords in the three corpora are the same.
** Calculated over the number of cases minus the non-adaptations.)

[minwi] (from French *minuit* [minɥi] 'midnight') and fully adapted [dilɥil] (from French *de l'huile* [də lɥil] '(PREP) oil').[9]

However, the Threshold Principle cannot explain the systematic deletion of the laryngeal /h/ in French, since /h/ in our database is not part of an ill-formed higher-level constituent, either syllabic or metrical. Table II shows that /h/ is never adapted in either QF or PF. As previously mentioned, it is the only segment in our entire database in Table I that is systematically deleted, notably in French. If we exclude the 12·8 % rate of its importation in Montreal French, /h/ is deleted, as opposed to adapted, in 100 % of the cases in three corpora of French.

Examples of /h/ deletion from our corpora of English loanwords in Quebec City French (QCF), Montreal Quebec French (MF) and Parisian French (PF) are presented in (7a), (7b) and (7c), respectively.

(7) /h/ *deletion in English loanwords in French*

	English		*QCF*
a.	hamburger	[hæmbəɹgəɹ]	[_ambəɹgəɹ]
	heater	[hiɾəɹ]	[_itœʁ]
	hold up	[hoɬdʌp]	[_oldɔp]
b.			*MF*
	Halloween	[hælowin]	[_ɑlowin]
	hold up	[hoɬdʌp]	[_oldɔp]
	hot chicken	[hɑtʧɪkən]	[_ɔtʧɪkən]
c.			*PF*
	hard-rock	[hɑɹdɹɑk]	[_aʁdʁɔk]
	hold up	[hoɬdʌp]	[_oldɔp]
	home	[hom]	[_om]

[9] Fula /w/ is realised phonetically as [ɥ] before a front vowel in the native vocabulary, as discussed below.

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These examples show that /h/ deletion cannot be due to a double malformation, since the laryngeal /h/ is not contained within an unsyllabifiable sequence, as is the glide /ɥ/ in the French loanword *tuyau* [tɥijo] 'pipe' in Fula. How, then, can French's consistent failure to adapt the laryngeal /h/ be explained?

Two hypotheses, based on two different phonological representations that have been previously proposed for /h/, are conceivable: (a) /h/ is very underspecified (lacking, in particular, a place of articulation in underlying representation), rendering it particularly fragile and susceptible to deletion; (b) /h/ is composed of a primitive that French cannot deal with phonologically, namely the Pharyngeal node. The two hypotheses are formally presented in (8).

(8) a. *Underspecification Hypothesis* (Paradis & Lebel 1994)
The underspecification of /h/, notably its lack of an overtly specified place of articulation, results in its deletion in loanwords which are borrowed into languages that do not have a laryngeal in their inventories. Deletion occurs because the specification of /h/ would involve too many steps.

b. *Non-availability Hypothesis*
The laryngeal /h/ contains an unavailable (unemployed) primitive – the Pharyngeal node – in borrowing languages without pharyngeal node consonants in their phonological inventories. The laryngeal /h/ cannot be phonologically treated by these languages, and thus cannot be interpreted phonetically.

An unavailable phonological primitive is defined in (9).

(9) *Unavailable phonological primitive*
A phonological unit that is not employed by the borrowing language and which cannot be broken down.

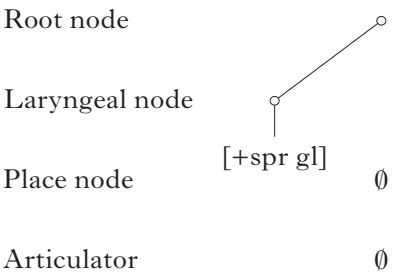
In TCRS, the non-availability of a phonological primitive in a given language results from a negative response to a parameterised option offered by UG. For example, the non-availability in French of the Pharyngeal node – a primitive employed by languages such as Arabic, English, Amharic, Harari, Argobba and Afar, but not by languages such as French, Italian, Portuguese and Gurage, which have no phonological pharyngeals – follows from a negative parameter setting such as that in (10).

(10) Pharyngeal?
Arabic, English, Amharic, Harari, Argobba, Afar: YES
French, Italian, Portuguese, Gurage: NO (constraint)

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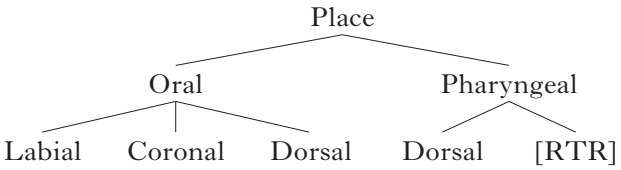
Paradis & Lebel (1994) invoke the underspecification hypothesis in (8a) to account for the systematic deletion of /h/ in the corpus of English words in QCF. That hypothesis is based on representations proposed by Steriade (1987a) to explain the fact that /h/ and /ʔ/ do not block the propagation of vowels in Acoma, Nez Perce, Yapese, Arbore, Yokuts, Kekchi, Tojolabal and Mohawk. From that perspective, /h/ and /ʔ/ are transparent to the propagation of vowels because they lack a place of articulation in underlying representation. In contrast to a consonant like /b/, for example, which has a Labial articulator that is dominated by the Place node (following Clements 1985, Sagey 1986, etc.), the laryngeal /h/ is comprised of only the feature [+spread glottis], dominated by the Laryngeal node. Placeless /h/ is depicted in (11).

(11) *Representation of* (*placeless*) *laryngeal* /h/ (Steriade 1987a, Bessell 1992)



According to Steriade (1987a) and Bessell (1992), it is the laryngeals' lack of a specified place of articulation which universally distinguishes them from other segments. The universality of such a representation for laryngeals is not supported by either McCarthy (1991, 1994) or Rose (1996). Both maintain that laryngeals in some languages do possess a Place node and a specified articulator, namely the Pharyngeal node (the conditions under which the Pharyngeal node is specified for laryngeals, which are not identical for the two authors, will be discussed in §7). Rose (1996), whose model is heavily influenced by that of McCarthy (1991, 1994), proposes the general feature geometry given in (12).

(12) *Rose's* (1996) *model* (*partial representation*)



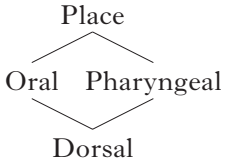
The models of both McCarthy and Rose allow us to distinguish among the gutturals, but we adopt Rose's model, which is more recent. We will not discuss the differences between the two models, given their irrelevance to the present purpose. As shown in (12), Rose's model subdivides the Place node into the Oral node and the Pharyngeal node. The place features of the gutturals with which we will be concerned in the present study are

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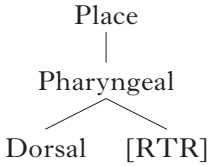
represented, following Rose, in (13b–d). For the velar fricatives, we propose the representation in (13a), which is partly an extrapolation from Rose's (1996: 80) approach to the representation of the uvulars.

(13) *The place features of gutturals*

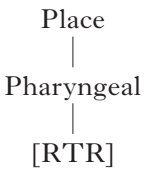
a. *velars* (x ɣ)



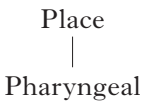
b. *uvulars* (χ ʁ ʀ)



c. *pharyngeals* (ħ ʕ)



d. *laryngeals* (h ʔ)



When there is more than one type of guttural in a given language – in Arabic, for example – the presence of Dorsal and/or [RTR] is necessary to distinguish formally among them. However, the differentiating articulatory feature must be dominated by the same place of articulation – in this case Pharyngeal – since, as shown by McCarthy (1991, 1994), among others, the gutturals can behave as a natural class, distinct from the class of labials, coronals and velars. We suggest that velar fricatives, represented in (13a), also have a Pharyngeal node, dominating Dorsal, while velar stops do not have a Pharyngeal node. In other words, the Dorsal node of velar fricatives is dominated by both the Oral and Pharyngeal nodes, whereas the Dorsal node of velar stops is dominated by only the Oral node. The different treatment of the velar stops and fricatives is inspired by Rose's (1996: 80) representation for uvulars. In her model, the Dorsal articulator of uvular fricatives is dominated by the Pharyngeal node, while that of uvular stops is dominated by the Oral node.

Velar fricatives are not generally regarded as gutturals, but the representation we propose in (13a) is independently justified. The velar fricatives are shown to pattern with gutturals in Iraqi (Erwin 1963: 22), in Palestinian Arabic (Herzallah 1990: 57) and in eastern and northern Arabic dialects more generally (Johnstone 1967: 6). There are cases where velar fricatives do not pattern with other gutturals, but we must bear in mind that features other than Pharyngeal are also in play. Rose (1996: 82) argues that guttural-induced vowel lowering is due, in some cases, to the feature [RTR], not to the Pharyngeal node *per se*. Not being specified for [RTR], velar fricatives are not expected to have this kind of lowering effect (see McCarthy 1991, 1994 and, especially, Rose 1996 on the lowering effect). The patterning of velar fricatives with other gutturals may also be

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blocked in some cases by their Oral node. That is, velar fricatives are not purely gutturals.

There may also be phonetic justification for distinguishing between velar stops and fricatives. Bessell (1992: 70) consistently describes /k/ as velar for all the Arabic dialects she considers (Syrian, Egyptian, Iraqi, North African and Palestinian), while /x/ and /ɣ/ are described as being back velar, dorso-uvular or even uvular, depending on the dialect. All this aside, we point out that new and independent facts provided here, based on the adaptation of loanwords, indicate that the distinction between velar fricatives and stops is phonologically justified. Indeed, as we will see shortly, the laryngeal /h/, a consonant with a Pharyngeal node, is systematically adapted in languages that have a phonemic velar fricative or another post-velar, and it is systematically deleted in languages without such phonemic fricatives.

Before leaving this section, let us mention that the pharyngeal specification of laryngeals in (13d) is also supported by the fact that these sounds are labialised in some languages. Paradis & Prunet (1994) show that /ʔ/ is labialised in Inor, a Semitic language spoken in Ethiopia. Catford (1983) notes the same phenomenon for both /h/ and /ʔ/ in some Caucasian languages. The fact that in Inor, labials, velars and /ʔ/ may be labialised, but not coronals (even those that must have a specified Coronal node) means that labialisation selects candidates on the basis of their articulator nodes. It follows that the laryngeals must have an articulator node in order to be labialised.[10]

The Underspecification Hypothesis in (8a), which is based on the representation shown in (11), and the Non-availability Hypothesis in (8b), which is based on Rose's representations for laryngeals, as seen in (13d), make different predictions about the behaviour of /h/. These divergent predictions are summarised in (14) and (15).

(14) *Predictions following from the Underspecification Hypothesis* (8a)

a. Unless imported, the laryngeal /h/ ought to be deleted in words borrowed by any language which does not have this particular segment in its own inventory, since the specification necessary for the adaptation of this consonant, namely the insertion of a place of articulation, should be equally problematic for any such language.

[10] To maintain the view that laryngeals, including the glottal stop, are placeless, one might alternatively posit a constraint prohibiting the co-occurrence of the Coronal and Labial nodes. This would entail that coronals, like other non-laryngeals, have a place node and would explain why they are not labialised. In this view, the floating [+round] feature would target any non-coronal consonant, including the glottal stop; this would eliminate the need to refer to an articulator for the glottal stop. However, this proposal is less attractive because it does not explain why the putatively placeless glottal stop does not become a labial as opposed to labialised consonant.

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b. Given that only the laryngeals (/h ʔ/) are considered to be underspecified for an articulator node, these should be the only consonants to yield to systematic deletion in any language that does not have these segments in its inventory.

(15) *Predictions following from the Non-availability Hypothesis* (8b)

a. Only languages that employ the Pharyngeal articulator node phonologically (as evidenced by the presence of one more other gutturals /x ɣ χ ʁ ʁ ħ ʕ ʔ q ɢ/ in the language) can adapt the laryngeal /h/. Such languages should adapt rather than delete /h/ (within the limits of the other Ll constraints at work).

b. Since the laryngeal /h/ is not the only consonant to possess a Pharyngeal node, it should not be the only consonant to be systematically deleted in languages that do not employ that articulator in the phonological specification of their own inventories.

The Underspecification Hypothesis in (8a) holds that laryngeals are universally without an articulator and that it is this lack, among others, which creates a problem for a language without /h/ in its own inventory. However, according to the Non-availability Hypothesis in (8b), the laryngeals, like other gutturals, have a Pharyngeal articulator node. It is the absence of this articulator node in the borrowing language which causes the problem and, consequently, the deletion of /h/ in loanwords. Note that this does not mean that a language with a phonemic laryngeal consonant will necessarily adapt all gutturals to that laryngeal. Other factors, including co-occurrence restrictions and the non-availability of other features, also play a role, as we will see in the adaptation of Arabic loanwords in English (§5).

The Underspecification Hypothesis faces at least two conceptual problems. First, like other current phonological models, TCRS considers redundancy rules, such as those that serve to elaborate an underlyingly underspecified segment, to be cost-free. These are default rules which add only redundant information.[11] In this view, it is difficult to see how even a drastically underspecified segment could impose too heavy a procedural cost (too many steps in its specification). Second, consonants lacking a specified place of articulation are generally considered to receive a Coronal articulator node by default. This is formally expressed by the redundancy rule in (16), adopted by several researchers (notably the contributors to Paradis & Prunet 1991).

[11] The two main models of underspecification, radical underspecification (see Archangeli 1984) and contrastive underspecification (Steriade 1987b), have somewhat divergent notions of redundancy. However, these differences are not relevant here.

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(16) *Default rule*

∅ Place (of articulation) → Coronal

One must ask why the laryngeal /h/ – if the problem of its adaptation lies in its underspecification – is not adapted as /t/, the most neutral coronal, or as /s/, the unmarked fricative. In other words, what prevents the laryngeal /h/ from receiving a default Coronal articulator? This question is left unanswered in Paradis & Lebel (1994). The search for an explanation, other than underspecification, for the special behaviour of /h/ has led to the Non-availability Hypothesis.

	MS-1	MS-2	*total*
consultants	3	3	6
loanwords containing /h/	33	40	43 *
forms	76	104	180
relevant malformations	76	104	180
non-adaptations of /h/	27 (35·5%)	20 (19·2%)	47 (26·1%)
relevant cases excluding non-adaptations	49	84	133
adaptations of /h/ **	49 (100%) h → x	82 (97·6%) h → x	131 (98·5%) h → x
deletions of /h/ **	0	2 (2·4%)	2 (1·5%)

Table III

Behaviour of /h/ in English loanwords in Mexican Spanish.
(*The majority of the loanwords in the two corpora are the same.
** Calculated over the number of cases minus the non-adaptations.)

On an empirical level, one of the corpora presented in Table I already constitutes a counterexample to the Underspecification Hypothesis in (8a). The laryngeal /h/ in English loanwords in Mexican Spanish is not deleted, contrary to what underspecification predicts. Rather, it is replaced by the velar fricative /x/ – called jota in Spanish – another segment with a Pharyngeal node. Such replacement is predicted by the Non-availability Hypothesis. Table III shows that, in two corpora of English loanwords in Mexican Spanish (MS-1 and MS-2) the laryngeal /h/ is either imported or replaced by the velar fricative /x/.[12] The number of deletions is

[12] The MS-2 corpus does not yet feature in the overall statistics in Table I because it was still being analysed at the time of writing. However, statistics reported in Table III regarding the behaviour of /h/ in the MS-2 corpus were already available. The corpus was constructed by Élyse Bolduc, who gathered the data from three monolingual Hispanophone consultants in Aguascalientes, Mexico during summer 1998; both the corpus and the completed analysis are now available.

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negligible (2/180 malformations, i.e. 1·1 %). In contrast, importations and adaptations account for 178/180 malformations, i.e. 98·9 %. The laryngeal /h/ is adapted in 131/133 relevant malformations (excluding importations), i.e. 98·5 % of the cases.

Besides explaining the non-deletion (the adaptation) of /h/ in the MS corpora, the Non-availability Hypothesis accounts for the systematic deletion of /h/ in the French corpora, as indicated in Table II. Systematic deletion is predicted of a language that does not have a distinctive Pharyngeal node consonant in its inventory, which is the case in French. Such a language cannot adapt a foreign guttural sound, like /h/.

One might object that the French rhotic is a uvular and thus has a Pharyngeal node, as shown in (13b). However, the uvular realisation of French /r/ is phonetic, not phonological.[13] The situation of French /r/ is not unlike that of the lateral in English, which is phonologically coronal, but which is velarised in certain contexts, according to dialect and even idiolect (see, for example, MacKay 1987, Giegerich 1992 and Picard 1987). In other words, just because the English lateral can be pronounced as a velar does not mean that it is represented as a velar underlyingly. In the same vein, just because the French rhotic can be realised as a uvular or even a pharyngeal does not mean that French employs the Pharyngeal node phonologically. Indeed, [ʁ] is only one of several different phonetic realisations of the phoneme /r/ that occur in French. The French rhotic can be pronounced as an apico-alveolar trill, [r], referred to as the rolled *r* (typical of many regions in both Quebec and France), as a rolled uvular, [ʀ], commonly called *r grasseyé*, or as a uvular fricative, [ʁ]. The French rhotic can even be pronounced in the pharyngeal region, which Francophones themselves do not hear but which Arabic speakers perceive very well (Pierre Martin, personal communication). Finally, any of the rhotic variants can be devoiced, particularly word-finally. Yet despite the considerably different acoustic and articulatory characteristics of these phonetic variants, French speakers recognise them as being one and the same phonological entity. In fact, rhotics might generally have no point of articulation underlyingly since they contrast on this ground only very rarely: 'A language with two or more r-sounds is unlikely to restrict their contrast to place of articulation. 55/60 91·7 %' (Maddieson 1984: 88). As mentioned by Hall (1997: 110), rhotics are distinguished in terms of manner or laryngeal features, rather than place features. Besides, uvular rhotics 'are quite rare (and mainly restricted to prestige dialects of Western European languages [French and German])' (Maddieson 1984: 81).

[13] The low vowel /ɑ/ is sometimes also thought to possess a Pharyngeal node (see Rose 1996: 111). Prunet (1996: 175) even suggests that the low vowel /ɑ/ can behave like a guttural glide. However, as in the case of the rhotic, the Pharyngeal node, even if it is present in French at a phonetic level, is not distinctive for the vowel in French. According to Hess (1990), a study on pharyngeal articulations in Akan and Arabic, the low vowels are not generally represented with a Pharyngeal node in underlying representation. Also, according to Prunet, not all low vowels are 'guttural'.

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We know of no internal evidence leading to the classification of the French rhotic as a uvular phonologically. But there is external evidence showing that it patterns as a coronal. Indeed, the French rhotic clearly functions with the other [+anterior] coronals in the group study of 23 aphasic patients conducted by Béland *et al.* (1993), and in loanword adaptation in general. As reported by Elmedlaoui (1996: 6), the French rhotic in French loanwords borrowed into Moroccan Arabic is systematically interpreted as a coronal sonorant, not as a uvular (e.g. Fr. *rasoir* 'razor' [ʁazwaʁ] → MA [razwar], not *[ʁazwaʁ]). This is confirmed in our corpus of French loanwords in Moroccan Arabic. Out of 1,374 cases, Fr. [ʁ] never corresponds to MA /ʁ/ in French loans. Clearly, bilingual Arabic speakers who adapt French loanwords classify the French rhotic as coronal, despite the fact that Arabic has a phonemic uvular /ʁ/ in its inventory of gutturals. The Arabic uvular fricative is widely described as being, phonetically, the uvular rhotic of French (Elias 1943: v, Van Wagoner 1949: 61, Mitchell 1956: 7, Tapiéro 1957: 1, Lecomte 1968: 10, Khawam 1982: 7, Jomier & Khouzam 1983: 1, etc.), presumably making Arabic speakers well equipped to correctly perceive and produce the uvular [ʁ] of French.

Not surprisingly, Arabic /r/, which is phonologically coronal and phonetically either flapped (Harrell 1962: 8, 1963: 3, Erwin 1963: 12), trilled (Elias 1943: v) or rolled (Tapiéro 1957: 1, Jomier & Khouzam 1983: 1) is always equated with the French rhotic (which is standardly realised as a uvular) in Arabic loanwords in French. Meanwhile, the Arabic uvular fricative, which is phonetically much closer, if not identical, to French [ʁ], is considered ill-formed in French and is systematically adapted as /g/ in Arabic loanwords in French, as will be discussed in §6.

Numerous examples of the irrelevance of phonetic variation to the phonological adaptation of (non-proper name) loanwords can be found in LaCharité & Paradis (2000). One is provided by a Fula example seen earlier. Consider again the French word *tuyau* [tɥijo] 'pipe', which is adapted as [tijo] in Fula. As previously noted, the glide /ɥ/ is considered illicit in Fula and is deleted when it is part of an unsyllabifiable cluster. In contrast, a cluster comprised of licit phonological segments is repaired by epenthesis (e.g. Fr. *glace* 'ice' [glas] → Fula [galas]). Of particular interest is that [ɥ] exists in Fula as a phonetic variant of the phonemic glide /w/ before the front vowels /i/ and /ɛ/ (e.g. /wəccɔ/ → [ɥɛccɔ] 'chest'). Yet even though [ɥ] exists as a phonetic variant in Fula, and even though it appears in the appropriate phonetic environment, i.e. before a front vowel, in words such as *tuyau* 'pipe' [tɥijo], Fula treats French /ɥ/ as ill-formed. Clearly, what matters is that the sound does not occur distinctively in Fula.

A second example showing that loanword adaptation refers to phonology, not phonetics, comes from the dialects of French spoken in several areas of Quebec, including Joliette and Drummondville. There, the fricatives /ʃ/ and /ʒ/ are often pronounced as [h] (sometimes [x] or [χ]). For example, *changer* 'to change' /ʃãʒe/ is pronounced [hãhe]. However,

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speakers of these dialects still delete the laryngeal /h/ in English loanwords, as is generally done by Francophones.[14]

The Fula and QF examples show that loanword adaptation is phonological, not phonetic. Whether or not sounds occur as phonetic variants in either the borrowing or the source language is immaterial (see Paradis & LaCharité 1997: 395–396 and LaCharité & Paradis 2000). As indicated by Moroccan Arabic speakers' adaptation of the French uvular rhotic, borrowers, who are bilingual, distinguish between phonemes and phonetic variants in the source language and base loanword adaptation on the former.

Let us now return to our main objective, which is to more amply verify the Non-availability Hypothesis. To this end, we built a corpus of likely-to-be-borrowed English words containing /h/, and compared their treatment in languages that have no Pharyngeal node consonants with their treatment in languages that do. We also assembled a corpus of Arabic loanwords containing at least one guttural, to observe their adaptation in French, Fula and English. The results are reported and discussed in §§3 and 4.

3 /h/ in languages with and without a Pharyngeal node: test and results

We began this facet of our research by compiling an ad hoc list of 40 English words (given in the Appendix), borrowed by a variety of languages. We then verified their adaptation in three types of language: (i) languages with a velar or post-velar fricative (European Spanish, Bulgarian, Catalan, Mandarin Chinese, Greek and Russian); (ii) languages with neither a velar nor post-velar fricative (Italian and Portuguese) and (iii) a language that has the laryngeal /h/ (German). The results for the

[14] We acknowledge that speakers of these dialects are not necessarily the bilinguals responsible for the importation of English loanwords into QF. These speakers generally only use the borrowed words that have been adapted by bilingual speakers of standard QF, which does not have the phonetic variant [h]. However, to verify our conclusions, we conducted an informal test with two balanced bilingual speakers of the Drummondville dialect, who use the phonetic variant [h] for /ʃ/ and /ʒ/ in QF. We asked them to pronounce non-established English borrowings beginning with the sound /h/, as they would consider appropriate when addressing a monolingual member of their family (who also uses the phonetic variant [h]). In the five words used for this informal test, /h/ was deleted, though our bilingual consultants use /h/ when speaking English. Of further interest is that our two consultants pronounce the well-established English loanword *shop* /ʃap/ as [hɔp] in QF. Though informal, this test further indicates that phonetic variants have little impact on the phonological adaptation of loanwords.

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first type of language, which have a consonant bearing a Pharyngeal node in their own inventories, are presented in Table IV.[15]

	European Spanish	Bulgarian	Catalan	Mandarin Chinese	Greek	Russian
consultants	2	3	2	3	2	3
loanwords containing /h/	14	21	10	4	22	12
forms	23	47	15	6	31	27
relevant malformations	23	47	15	6	31	27
non-adaptations of /h/	2 (8·7%)	2 (4·3%)	0	0	4 (12·9%)	1 (3·7%)
relevant cases excl. non-adaptations	21	45	15	6	27	26
adaptations of /h/	21 (100%) h → x	45 (100%) h → x	15 (100%) h → x	6 (100%) h → χ	27 (100%) h → x	26 (100%) h → x
deletions of /h/	0	0	0	0	0	0

Table IV

Behaviour of /h/ in English loanwords in languages which employ the Pharyngeal node.

As predicted by the Non-availability Hypothesis in (15a), the laryngeal /h/ is not deleted in any of the six languages which employ the Pharyngeal node in their native inventories. Apart from the cases where /h/ remains unadapted (8·7 % in European Spanish, 4·3 % in Bulgarian, 12·9 % in Greek and 3·7 % in Russian), it is systematically replaced (100 % of cases) by the available Pharyngeal node fricative in each language. More specifically, /h/ is adapted as /x/ in all but Mandarin Chinese, where it is adapted as the uvular fricative /χ/, the available guttural.[16] Examples of the adaptation of /h/ in the six languages are shown in (17).

(17) /h/ *adaptation in English loanwords in languages with a Pharyngeal node consonant*

[15] We have omitted from the statistics cases where /h/ is adapted as /g/ in Russian (e.g. *handball* [hænbɑɬ] → [ganbol]). This replacement is attributable to a change in orthography which happened in Russia when the Latin alphabet was replaced by the Cyrillic alphabet at the end of the last century (Goodwin 1980: 44). See Paradis & Prunet (2000: 336) for further details.

[16] A reviewer suggests that/h/ may be adapted as /x/ because it can be realised as such in English, notably before high vowels /i/ and/u/. However, in our corpus, /h/does not occur before /i/ or /u/; /h/ occurs before /ɪ/, another high vowel, in only 4/40 cases (10 %). Also, adaptations of English loanwords in Arabic show that English /h/ is consistently adapted as /h/ (47/47 cases), never to /x/, as seen in Sa'eed (1998).

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a.	*English*		*European Spanish*
	Halloween	[hæɬowin]	[xalowin]
	hippie	[hɪpi]	[xipi]
	hockey	[hɑki]	[xokej]
b.			*Bulgarian*
	high-fi	[hajfaj]	[xajfi]
	hamburger	[hæmbəɹgəɹ]	[xamburgɛr]
	handball	[hændbɑɬ]	[xanbɔl]
c.			*Catalan*
	hippie	[hɪpi]	[xipi]
	hobby	[hɑbi]	[xɔbi]
	hockey	[hɑki]	[xokej]
d.			*Mandarin Chinese*
	Halloween	[hæɬowin]	[χaluiŋ]
	handball	[hændbɑɬ]	[χaŋbɑl]
	high-fi	[hajfaj]	[χajfaj]
e.			*Greek*
	Halloween	[hæɬowin]	[xalowin]
	handball	[hændbɑɬ]	[xandbɔl]
	high-fi	[hajfaj]	[xajfaj]
f.			*Russian*
	hamburger	[hæmbəɹgəɹ]	[xamburgɛr]
	hobby	[hɑbi]	[xobi]
	hot-dog	[hɑtdɑg]	[xotdog]

As far as the second type of language – those that lack a Pharyngeal node consonant – is concerned, the French data have already shown that /h/ is deleted, as predicted by the Non-availability Hypothesis. However, one might consider French to be special, rather than representative, given the famous *h-aspiré* of French. The *h-aspiré* is a so-called mute consonant which never surfaces, but which is captured in the spelling. Normally, words beginning with a vowel in French submit to liaison, so that a word like *arbre* 'tree' in a phrase such as *un petit arbre* 'a small tree', is realised as [œ̃ pəti t̲aʁbʁ]. However, some words, such as *haricot*, do not submit to liaison (*un petit haricot* 'a small bean' is realised as [œ̃ pəti_aʁiko], not *[œ̃ pəti t̲aʁiko]). *H-aspiré* is used to explain the absence of otherwise expected liaison in French in words such as *haricot*. If one accepted the mute consonant hypothesis, and its extension to /h/ in English loanwords, this could undermine the Non-availability Hypothesis. English /h/ would simply be treated *as h-aspiré*; that is, its non-realisation in French would not be due to the fact that it contains an unavailable primitive.

However, we can think of three strong reasons for rejecting the *h-aspiré* explanation. First, French is not the only language that systematically

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	Italian	Portuguese
consultants	3	4
loanwords containing /h/	18	19
forms	30	47
relevant malformations	30	47
non-adaptations of /h/	0	7 (14·9%)
relevant cases excluding non-adaptations	30	40
adaptations of /h/	0	0
deletions of /h/	30 (100%)	40 (100%)

Table V

Behaviour of /h/ in English loanwords in languages without a Pharyngeal node consonant.

deletes rather than adapts English /h/. The results in Table V show clearly that the laryngeal /h/ is deleted also in Italian and Portuguese, two other languages without pharyngeal consonants, for which an *h-aspiré* explanation is out of the question.[17] From the perspective of the Non-availability Hypothesis in (15a), systematic deletion of the laryngeal /h/ in Italian and Portuguese (excluding non-adaptations, which occur in 14·9 % of the cases in Portuguese) is predictable, because neither language employs the Pharyngeal node. Examples of /h/ deletion are shown in (18).

(18) /h/ *deletion in English loanwords in Italian and Portuguese*

a.	*English*		*Italian*
	hamburger	[hæmbəɹgəɹ]	[_amburgɛr]
	hobby	[hɑbi]	[_ɔbi]
	hockey	[hɑki]	[_ɔke]
b.			*Portuguese*
	hamburger	[hæmbəɹgəɹ]	[_ɐ̃mburgɛr]
	hobby	[hɑbi]	[_ɔbi]
	hot-dog	[hɑtdɑg]	[_ɔtdɔg]

The second reason for rejecting the *h-aspiré* explanation is that, even in French, it is suspect. One might think that orthographic ⟨h⟩ induces the

[17] As in French, the most posterior phonemic consonants in Standard Italian and Portuguese are /k g w/ (Campbell 1998). Portuguese has a strongly rolled /r/ that has postvelar variants for some speakers (e.g. Azavedo 1981: 31). Nevertheless, the postvelar articulations are recognised to be variants of what is, phonologically, a coronal sound, whose distinguishing feature is the fact that it is strongly rolled, rather than flapped (e.g. Azavedo 1981: 32, Camara 1972: 43–44, da Fonseca 1984: 164). The distinction on the basis of manner features is more generally acknowledged. As Maddieson (1984: 88) observes, if a language has more than one rhotic, then these sounds are distinguished in terms of manner, rather than place features. In other words, the rolled rhotic of Portuguese is not generally considered a guttural phoneme.

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presence of a phonological (though phonetically mute) /h/ in French, but word-initial ⟨h⟩ does not always block liaison. In fact, numerous ⟨h⟩-initial words undergo liaison in French (e.g. *un hiver* [œ̃nivɛʁ] 'a winter'; *un hôpital* [œ̃nɔpital] 'a hospital'). Consider also *le héros* [lə_ero] 'the hero' *vs. l'héroïne* [lerɔin] 'the heroine', where liaison is blocked for the masculine but not for the feminine. This illustrates how unpredictable *h-aspiré* in French is. In English borrowings beginning with /h/, liaison is not always blocked either (e.g. *l'Halloween* [lɑlowin] 'Halloween' in QF).

Moreover, the absence of liaison in English words beginning unambiguously with a vowel is fairly frequent in QF. Pronunciations such as *un ice pack* [œ̃_ajspak] 'an ice pack', *un email* [œ̃_imel] 'an email' and *un egg roll* [œ̃_ɛgʁɔl] 'an egg roll' are common, particularly in Montreal French. The absence of liaison in vowel-initial loanwords can be attributed to the fact that marked nouns, including numbers, proper names and onomatopoeic words, generally do not submit to liaison (e.g. *un Yvon* [œ̃_ivɔ̃] 'an Yvon', *un onze* [œ̃_ɔ̃z] 'an eleven', *un ah!* [œ̃_a] 'an ah'). Only loanwords more fully integrated into QF (and not influenced by orthography) are expected to submit to liaison (e.g. *un iceberg* [œ̃nɑjsbəɹg] 'an iceberg' but also *un hamburger* [œ̃nambəɹgəɹ] 'a hamburger' for some speakers).

Finally, the hypothesis that there is a phantom /h/ in French poses serious problems for language acquisition, as is generally the case with absolute neutralisation. How can a child deduce the nature of a consonant that is never heard and that exerts no influence on surrounding segments that could provide some clue as to its nature? How can a synchronic underlying /h/ be justified, as opposed to a stop or a uvular fricative, or a pharyngeal since, as we will see in §4, all pharyngeal and laryngeal gutturals are deleted rather than adapted in French?

Before concluding this section we note that, not surprisingly, languages like German that have /h/ in their phonological inventories do not modify it in English loanwords. This was verified using three German consultants, who pronounced twenty English loanwords from our list. As predicted by the Preservation Principle, /h/ remains unchanged in 42/42 cases. Examples are given in (19).

(19) *English loanwords containing* /h/ *in German*

English		*German*
hamburger	[hæmbəɹgəɹ]	[hambʊrgəʳ]
hobby	[hɑbi]	[hɑbi]
hot-dog	[hɑtdɑg]	[hɔtdɔk]

The results presented in this section confirm prediction (15a) made by the Non-availability Hypothesis, and undermine prediction (14a) made by the Underspecification Hypothesis. The latter wrongly predicts that /h/ should be deleted in all the languages in Table IV, that is, Mexican and European Spanish, Bulgarian, Catalan, Mandarin Chinese, Greek and

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Russian, as well as in languages like French, Italian and Portuguese. In the next section, we turn to the second prediction following from the Non-availability Hypothesis, (15b), that laryngeals should not be the only gutturals to be deleted by languages without gutturals of their own.

4 The deletion of gutturals in Arabic words borrowed into French

Arabic, in contrast to French, has several gutturals in its segment inventory, including /χ ʁ q ʕ ħ ʔ h/.[18] To verify the prediction in (15b), we assembled a corpus of 208 Arabic loanwords in French (289 forms), each containing, in Arabic, at least one guttural word-initially or word-medially. We then observed their integration into French, based on pronunciations furnished by *Le Robert* dictionary, Perego (1960) and Duclos (1991). These pronunciations were independently verified by a French–Arabic bilingual phonetician. The Arabic pronunciations are Moroccan and Algerian Arabic – the dialects from which French is most likely to have borrowed. Examples of the French adaptation of Arabic loanwords containing the gutturals /ħ ʕ h ʔ/ are given in (20).

(20) *Arabic loanwords with pharyngeal and laryngeal gutturals in French*

	Arabic	*French*		
ħ	[ṣaħra]	[sa_ara]	sahara	'Sahara'
	[ħænna]	[_ene]	henné	'henna'
	[ħæriːm]	[_arɛm]	harem	'harem'
	[ħiʒæb]	[_iʒab]	hijab	'hijab'
ʕ	[ʕarab]	[_arab]	arabe	'Arab, Arabic'
	[ʕifrit]	[_ifrit]	efrit	'efreet'
	[saʕudida]	[sa_udit]	saoudite	'Saudi'
h	[hrisa]	[_arisa]	harissa	'harissa'
	[hɪʒra]	[_eʒir]	hégire	'hegira'
	[dɪrhɪm]	[dir_am]	dirham	'dirham'
ʔ	[ʔislæːm]	[_islam]	islam	'Islam'
	[ʔimæːm]	[_imam]	imam	'imam'
	[ḳɔrʔɑːn]	[kor_ɑ̃]	koran	'Koran'
	[ʔimaːra]	[_emira]	émirat	'emirate' (Classical Arabic loan)

[18] As mentioned in §2, and as will be further discussed in §6, in several dialects of Arabic the uvulars /χ/ and /ʁ/ are realised as [x] and [ɣ], respectively. The voiceless velar/uvular fricative of Arabic is described as being the same as the jota of Spanish or the /x/ of German and the voiced as being the French uvular rhotic (Elias 1943: v, Van Wagoner 1949: 60, Brunot 1950: 37, Tapiéro 1957: 1, Harrell 1962: 5, Khawam 1982: 12, Jomier & Khouzam 1983: 1, etc.). Uvular and velar fricatives do not contrast in any dialect of Arabic and, as noted in §2, in dialects where the fricatives are phonetically velar, they pattern with gutturals (Herzallah 1990, Bessell 1992). Therefore, we treat Arabic [x] and [ɣ] as uvular, phonologically, in accordance with standard practice.

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As expected, the laryngeal /h/ of Arabic is systematically deleted in Arabic words borrowed into French, just as is English /h/ in loanwords in French. Setting aside importations, Arabic /h/ is deleted, as opposed to adapted, in 27/28 cases (96·4%). However, what is more interesting about (20) is that it shows that other gutturals, specifically /ħ ʕ ʔ/, are also systematically deleted in French. Voiceless pharyngeal /ħ/ is deleted in 44/52 cases (84·6%) and voiced pharyngeal /ʕ/ is omitted in 46/51 cases (90·2%). Finally, the glottal stop is deleted in 19/19 cases (100%). The overall statistics are summarised in Table VI, where it is seen that deletion applies in 136/150 cases (90·7%).

	h	ħ	ʕ	ʔ	*total*
relevant cases	30	62	51	19	162
non-adaptations	2 (6·7%)	10 (16·1%)	0 (0%)	0 (0%)	12 (7·4%)
relevant cases excl. non-adaptations	28	52	51	19	150
adaptations *	1 (3·6%)	8 (15·4%)	5 (9·8%)	0 (0%)	14 (9·3%)
deletions *	27 (96·4%)	44 (84·6%)	46 (90·2%)	19 (100%)	136 (90·7%)

Table VI

Behaviour of gutturals in Arabic loanwords in French.
(* Calculated over the number of cases minus the non-adaptations.)

In only 1/28 cases (3·6%) is /h/ adapted (Ar. *h'dia* [hdijja] → Fr. [adia] 'gift'). The pharyngeal /ħ/ is adapted in 8/52 cases (15·4%), to /ʁ/ (1 case), /x/ (2 cases), /h/ (4 cases) and /a/ (1 case). As for the pharyngeal /ʕ/, it is adapted in 5/51 cases (9·8%), to /g/ (1 case) and /a/ (4 cases). Since /x/ and /h/ are not part of the French phonemic inventory (like /ħ/, they both employ the Pharyngeal node, an unavailable Place node in French), and the adaptations are unusually inconsistent, especially in view of the small number of cases, we believe that the reported adaptations above are most likely poorly produced importations rather than phonological adaptations. In any case, adaptations represent only 14/150 cases (9·3%), which indicates that it is clearly not the preferred strategy. Leslau (1990: 109) presents a corpus of Arabic loanwords in Gurage, an Ethiopian Semitic language, which shows the same deletion pattern. Gurage, like French, has no gutturals of its own and, as in French, the gutturals are systematically deleted in Arabic loanwords.

Thus, prediction (15b) made by the Non-availability Hypothesis is confirmed. If the elision of /h/ in English loanwords in French is due to the fact that French does not employ the Pharyngeal node phonologically, then we expect that any consonant whose sole articulator node is Pharyngeal – as is the case of pharyngeal and laryngeal gutturals – will be systematically deleted. Deletion of pharyngeal gutturals is problematic for the Underspecification Hypothesis, since only laryngeals are presumed to be placeless.

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5 Arabic gutturals in two languages employing the Pharyngeal node

5.1 Arabic gutturals in Guinea Fula

Guinea Fula has the laryngeals /h ʔ/, but not the other gutturals of Arabic, i.e. the uvular fricatives /χ ʁ/, the uvular stop /q/ and the pharyngeals /ħ ʕ/. The Non-availability Hypothesis predicts in (15a) that the borrowing language should be able to replace non-occurring gutturals with those that do occur in the borrowing language (within the limits of the other L1 constraints at work). A study of Arabic loanwords in Fula bears this out, as shown in (21). The ten Arabic loanwords that we collected come from the corpus of Diallo (1992), a dissertation on the integration of Arabic loanwords in the author's mother tongue, Guinea Fula.

(21) *Arabic loanwords with word-initial and medial gutturals in Guinea Fula*

	Arabic	*Guinea Fula*	
a. ħ → h	[baħru]	[baharu]	'sea'
(7/7 cases, 100 %)	[ruuħu]	[ruuhu]	'soul'
	[ħizb]	[hizb]	'hell'
b. ʕ → ʔ	[ʕaafija]	[ʔaafija]	'relief'
(3/3 cases, 100 %)	[bidʕa]	[bidʔa]	'superfluous'
	[ʒaamiʕ]	[ʤaamiʔu]	'mosque'

As anticipated, the two gutturals that Fula does not possess, /ħ/ and /ʕ/, are replaced by other gutturals, namely /h/ and /ʔ/, which occur distinctively in Guinea Fula. Diallo (1992: 192) reports that the adaptations presented in (21) are regular. These are also the adaptations reported in Abu-Manga (1986), a study on the integration of Arabic loanwords in Sudanese Fula (Fulfulde).

In Mauritania Fula (MF), the voiceless pharyngeal /ħ/ is also adapted as /h/ in 5/5 cases. As for the voiced pharyngeal, /ʕ/, it is replaced by a laryngeal in the majority of cases (66·7 %): /ʕ/ → /ʔ/ (3/6 cases), /ʕ/ → /h/ (1/6 cases), as seen below.

(22) *Arabic loanwords with word-initial and medial gutturals in MF*[19]

	Arabic	*MF*	
a. ħ → h	[ħgər]	[hɑkrɛ]	'trickery'
(5/5 cases, 100 %)	[ħəlqumɑ]	[hulquumɑ]	'Adam's apple'
	[ruuħu]	[ruuhu]	'soul'

[19] Those loanwords were collected from diverse sources, including Paradis (1992). Their pronunciation was double-checked with another consultant, a native speaker of Mauritanian Fula.

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b. ʕ → ʔ/h	[bidʕa]	[bidʔa]	'superfluous'
(4/6 cases, 66·7 %)	[ʃaaʕa]	[saʔa]	'hour'
	[ʕaqil]	[hakkille]	'spirit'

In the two other cases, the voiced pharyngeal is deleted: Arabic [muʕaddib] → MF [moodi] 'lord' and [niʕma] → MF [neema] 'charity'. Note that Fula [moodi] differs from its source in several respects, which suggests that we are dealing with an old or indirect borrowing. This leaves [neema], which can be handled by the fact that preconsonantal and intervocalic glottal stop are extremely rare in MF, whereas preconsonantal /h/ is simply impossible (Paradis 1992: 147ff). In fact the phonological status of the glottal stop is not as clear in MF as in the other Fula dialects. Paradis (1992) suggests that the glottal stop in MF is mostly if not entirely phonetic. This is supported by the fact that the glottal stop of Arabic is conserved in only 57·1 % of the cases, that is 4/7 pronunciations provided by our MF consultant. In nearly half the cases, it is deleted. In contrast, Arabic /h/ is retained, unchanged, in 100 % of the cases (30/30 cases). If we cautiously disregard the behaviour of the glottal stop in MF, whose status is uncertain, we see that the Arabic gutturals are systematically adapted, not deleted. Even the glottal stop is not systematically deleted.

5.2 Arabic gutturals in English

English has the guttural /h/ in its phonological inventory. Thus, English, like Fula, is predicted not to show the same pattern of deletion of non-occurring Arabic gutturals as French. This is confirmed by the adaptations found in a corpus of 71 recent (mostly post-1900) Arabic loanwords in English (yielding 178 forms), culled from the *OED*, news reports, menus, etc. Each Arabic word contains at least one guttural sound. Because many of these loanwords remain specialised and are not (yet) in widespread use in English, we consulted four English speakers who have had more than average exposure to Arabic culture, having worked in an English-language environment within various Arabic-speaking countries for between two and five years. Their English pronunciations were tape-recorded and transcribed by us, in consultation with two Arabic-speaking phonologists/phoneticians. The Arabic pronunciations of the borrowings were provided by two Arabic speakers, one a native speaker of Iraqi, the other a native speaker of Algerian. The statistics for the treatment of ill-formed gutturals, notably /ħ ʕ ʔ/, in Arabic loanwords in English are given in Table VII.

The difference between English, a language with a Pharyngeal node sound, /h/, and French, a language without such a consonant, is most apparent in the treatment of Arabic /ħ/, which does not occur in either English or French. If we exclude non-adaptations (9/43 cases), Arabic /ħ/ is found in 34 forms in English. In 34/34 cases (100 %), it is adapted.

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	χ	ʁ	q	ħ	ʕ	ʔ
relevant cases	16	12	19	43	45	14
non-adaptations	6 (37·5%)	1 (8·33%)	1 (5·26%)	9 (20·9%)	10 (22·2%)	3 (21·4%)
relevant cases excl. non-adaptations	10	11	18	34	35	11
adaptations *	10 (100%)	11 (100%)	18 (100%)	34 (100%)	5 (14·3%)	0 (0%)
deletions *	0 (0%)	0 (0%)	0 (0%)	0 (0%)	30 (85·7%)	11 (100%)

Table VII

Behaviour of ill-formed gutturals in Arabic loanwords in English.
(* Calculated over the number of cases minus the non-adaptations.)

Unlike what happens in Arabic words borrowed into French, /ħ/ is never deleted in the loanwords found in English. It is almost always adapted as /h/ (32/34 cases, 94·1 %). (23) exemplifies /ħ/ deletion in French and its adaptation (to /h/) in English using Arabic words that have been borrowed by both languages.

(23) *A comparison of English and French treatment of Arabic* [ħ]

Arabic		*English*	*French*	
halal	[ħalá:l]	[həlá:l]	[_alal]	'killed as prescribed by Islamic law'
hajj	[ħa:ʒʒ]	[haʤ]	[_aʒ]	'pilgrimage to Mecca'
harka/ harki	[ħarka]/ [ħarki]	[ha:ka]	[_aʁki]	'irregular Moroccan troops'

One might try to account for the English adaptation /ħ/ → /h/ phonetically, i.e. by appealing to the notion that both sounds are perceptually close. However, aside from being inconsistent with what is generally seen in loanword adaptation (see LaCharité & Paradis 2000), that explanation is questionable for the Arabic data itself. Several sources (e.g. Ferguson 1961 : 83) remark on the acoustic proximity of the Arabic voiceless uvular fricative /χ/ – rather than the voiceless pharyngeal /ħ/ – to English /h/, suggesting that beginning speakers of Arabic are more likely to confuse the Arabic /χ/ and /h/. Such confusion would surely be further reinforced by the facts that the Arabic uvular is realised as [x] in many dialects and, as pointed out in note 16, that English /h/ is often realised as [x] in the enviromnent of high vowels. Yet in loanword adaptation, the Arabic uvular fricative /χ/ is systematically replaced by /k/ in English, not /h/, as indicated by the following examples.

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(24) *Arabic loanwords with the uvular fricative in English*

Arabic	*English*		
[χábar]	[kəbáɹ]	khabar	'information'
[χuːr]	[koɹ]	khor	'low land'
[muχtáːr]	[múktar]	mukhtar	'minor official'
[ʃáiχa]	[ʃékə]	sheikha	'wife of a sheikh'

Among the 16 Arabic loanword forms in English, the uvular fricative /χ/ is adapted, as opposed to imported, in 10/16 cases (62·5 %). In 10/10 adaptation cases (100 %), /χ/ is adapted to /k/, an adaptation that is hard to explain phonetically. That adaptation to /k/ is cross-linguistically regular. It occurs in many other languages without velar fricatives, including French (to be discussed in §6), Gurage, Argobba and Amharic (Leslau 1990).

Let us now consider the fate of the glottal stop in Arabic loanwords in English. As shown in Table VII, out of 14 cases analysed, /ʔ/ is imported in 3 cases (3/14; 21·4 %) and deleted in 11 non-imported cases (11/11; 100 %). The English treatment of Arabic gutturals, most notably the deletion of the glottal stop, might be interpreted as a counterexample to our prediction that a language that employs the Pharyngeal node sound in its inventory should be able, in principle, to adapt foreign Pharyngeal node sounds. In other words, the fact that English does not adapt Arabic /ʔ/ as /h/ may seem to cast doubt on the notion of non-availability as an explanation for the deletion of /h/ that is found in French, Italian and Portuguese. However, we maintain that English does conform to predictions and, in fact, provides additional support for the Non-availability Principle. Significantly, /ʔ/ is not the only Arabic consonant to be consistently deleted in English. The Pharyngeal /ʕ/, found in 45 forms in our corpus, is imported in 10 cases (10/45; 22·2 %) but deleted in 30/35 non-imported cases (85·7 %).[20]

It is important to point out that the same pattern of adaptation and deletion seen in English exists in other languages whose sole guttural is the laryngeal /h/. As shown by the corpora of Arabic loans provided by Leslau (1990), Arabic /ħ/ is adapted as /h/ in the Ethiopian Semitic languages Amharic and Argobba, while both /ʕ/ and /ʔ/ are deleted. This supports the idea that languages with /h/ in their inventories can adapt Pharyngeal node consonants and also the idea that both /ʕ/ and /ʔ/ share a structural property in addition to the Pharyngeal node.

As we will discuss in §6, in addition to having a Pharyngeal node, both /ʕ/ and /ʔ/ are characterised by the feature [+constricted glottis]. Although the Pharyngeal node of the glottal stop and the voiced pha-

[20] Among the five cases where /ʕ/ is adapted, it is adapted to /h/ in two cases (2/5; 40 %). In the remaining three cases, /ʕ/ is adapted to the non-native uvular fricative /χ/. Again, we believe that those adaptations might be poorly produced importations.

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ryngeal can be interpreted in English, the feature [+constricted glottis] cannot. This presents a contrast to Fula (except perhaps MF), which has a phonological glottal stop and thus employs the feature [+constricted glottis]. As we will show in §6, the non-availability of this feature in English prevents the adaptation of /ʕ/ and /ʔ/.

We conclude this section on the English adaptation of Arabic sounds by pointing out that, overall, the deletion of what are – from the point of view of English – non-occurring Arabic sounds, is unusual. It never occurs in the adaptation of /x/χ/, /ɣ/ʁ/, /q/ and /ħ/. The relevant statistics for these sounds, from Table VII, are repeated in Table VIII.

gutturals	forms	non-adaptations	adaptations *	deletions *
χ	16	6 (37·5%)	10 (100%)	0 (0%)
ʁ	12	1 (8·3%)	11 (100%)	0 (0%)
q	19	1 (5·3%)	18 (100%)	0 (0%)
ħ	43	9 (20·9%)	34 (100%)	0 (0%)

Table VIII

Behaviour of /χ ɣ/ʁ q ħ/ in Arabic loanwords in English.
(* Excluding non-adaptations.)

In the next section, we will see that the systematic adaptation of /x/χ/, /ɣ/ʁ/, /q/ and /ħ/ and deletion of /ʕ/ and /ʔ/ are predicted by the phonological make-up of the sounds, operating in conjunction with the principles of loanword adaptation, including the Non-availability Principle.

6 The representation of the adaptations and the Non-availability Principle

The results reported in the preceding two sections conform to the predictions of the Non-availability Hypothesis, in (15), which has prompted us to encode it in a formal principle, given in (25). A non-available primitive, as defined in (9), consists of a non-decomposable phonological unit which the borrowing language does not use.

(25) *Non-availability Principle*

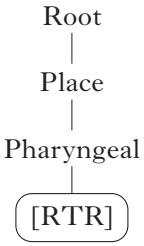
A phonological primitive which is not available in the borrowing language cannot be phonologically manipulated (either inserted or deleted) by that language.

The Non-availability Principle, in conjunction with the representation provided by Rose (1996) in (15d) – which renders the Pharyngeal node formally accessible to laryngeals – permits us to account straightforwardly for the adaptations observed in §5. The adaptations /ħ/→/h/ and /ʕ/→/ʔ/ in Arabic loanwords in Fula can be expressed as the non-

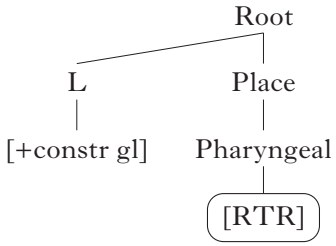
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treatment of the pharyngeal dependent [RTR], as shown in (26), where the unavailable primitive is circled.

(26) a. ħ → h



b. ʕ → ʔ



Since [−voice] is unmarked for obstruents, the voiceless pharyngeal /ħ/ bears no voicing specification. The [RTR] feature of the voiceless pharyngeal is an unavailable primitive from the point of view of Fula, but the Pharyngeal node itself is available. Because the only consonant with a bare Pharyngeal node is /h/, the passive adaptation schematised in (26a) yields /h/. With respect to the voiced pharyngeal /ʕ/,[21] it is adapted as the glottal stop in Fula, as in (26b). The glottal stop is the only consonant that, like the voiced pharyngeal, bears the feature [+constricted glottis] (we return to this point shortly).

Interestingly, the reverse adaptation is found in Afar. There, the two Arabic laryngeals, /h/ and /ʔ/, which Afar does not have in its inventory, are adapted as /ħ/ and /ʕ/, respectively (Leslau 1997; see also Hayward 1974 on the phonological inventory of Afar). In Afar, [RTR] is an available primitive, so the Arabic pharyngeals /h/ and /ʔ/ are adapted via the insertion of this feature. This suggests that /ʕ/ and /ʔ/ are structurally similar. Loanword adaptation is not the only source of evidence which points to the structural similarity of the voiced pharyngeal and the glottal stop. Bessell (1992: 73) indicates that alternation between /ʕ/ and /ʔ/ within various Arabic dialects is well attested both synchronically and historically.

Characterising the voiced pharyngeal /ʕ/ with the feature [+constricted glottis] is phonetically as well as phonologically motivated. Erwin (1963: 28) notes that, in Iraqi Arabic, geminate /ʕ/ has an abrupt release tending to sound 'somewhat like a prolonged *ɛ* followed by the glottal stop ʔ'. Word-final /ʕ/ is also described as sounding as if it were followed quickly by a glottal stop (Erwin 1963: 9). Van Wagoner (1949: iv) describes the articulation of /ʕ/ in the same terms as /ʔ/, both being 'sharp'. Khawam (1982: 16) says that /ʕ/ is articulated by forcing the sound from the larynx, as opposed to from the lungs. Tapiéro (1957: 6), too, says that the airstream for /ʕ/ is generated at the throat, rather than from the lungs, in

[21] According to Butcher & Ahmad (1987: 157), the pharyngeal /ħ/ is voiceless while /ʕ/ is 'probably voiced'.

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contrast to /h/. Abdul-Rauf (1977: 10) describes /ʕ/ as 'a strong guttural produced by compressing the throat and exploding the breath'. Bessell (1992: 73) specifically notes that /ʕ/ is accompanied by glottal release in Iraqi and Moroccan. Butcher & Ahmad (1987) hesitate as to whether /ʕ/ is a stop or a fricative, but their description, too, supports the view that /ʕ/ is [+constricted glottis]. They conclude that both /ħ/ and /ʕ/ are defective fricatives, their failings due to the fact that it is difficult to produce fricatives in this region of the throat: 'It could be argued that both are ''target'' fricatives in an area of the vocal tract not particularly well suited to such articulations. The available alternatives are either an approximant articulation, involving general constriction of the pharynx (including larynx raising and optional velum lowering) or a stop articulation, either at the epiglottis or, perhaps more likely, at the glottis' (Butcher & Ahmad 1987: 171). They add that, for /ħ/, only the first option – approximation – is possible, while for /ʕ/ glottal constriction is also likely: 'In the case of /ʕ/, however, turbulence is not achievable with this combination of glottal and articulatory strictures. Further constriction of the pharynx is accompanied by constriction of the larynx and may lead to complete interruption of the airflow at one or both places' (1987: 171). This is why /ʕ/ is often described as being phonetically neither clearly fricative nor clearly occlusive. The authors indicate that /ħ/ is generally produced with more friction than /ʕ/, even though both consonants can be realised as approximants. As for Prunet (1996), the voiced pharyngeal is a stop. He notes on more phonological grounds (1996: 200):

> Particularly noteworthy is the consequence that the two pharyngeals *ʕ and *ħ differed substantially and in fact do not seem to have formed a minimally contrastive pair of phonemes: the former but not the latter had glottal constriction. The voicing inherent to *ʕ cannot be responsible for its different behavior from *ħ because the voiced pharyngeal patterned in this respect with the voiceless *ʔ. The evolution of Gurage gutturals into two sets which pattern differently with respect to glottalization can be correlated with Al-Ani's (1978: 89) contention that phonetically Arabic gutturals should be divided into the two stops /ʕ, ʔ/ and the two fricatives /ħ, h/. Another instance where [ʕ] patterns with stops in Ethiopian Semitic is noted by Raz (1983: 5), who observes that before a consonant the Tigre velar ejective /q/ weakens to [ʔ] or [ʕ], e.g. /liqluq/ 'smeared' can be pronounced [loʔloʔ] or [loʕloʕ].

In the light of these phonetic and phonological facts, it is reasonable to treat the voiced pharyngeal /ʕ/ as [+constricted glottis].

The guttural representations proposed by Rose (1996), working together with the Non-availability Principle, provide a straightforward account of the adaptation of the uvular fricatives /χ/ and /ʁ/ in Arabic loanwords in French. As we see in the examples in (27), these sounds are systematically replaced by /k/ and /g/ in French (as in English – see (24) – and Gurage, Argobba and Amharic – see Leslau 1990).

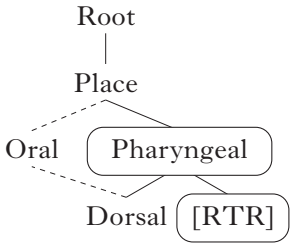
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(27) *Arabic loanwords with the uvular fricative in French*

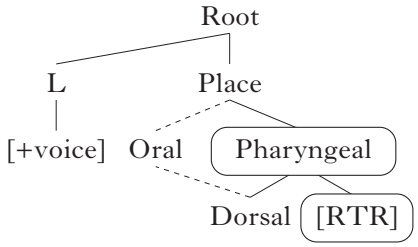
Classical Arabic	*French*		
[ʃajχ]	[ʃɛk]	cheik	'sheikh'
[χali:fa]	[kalif]	calife	'calif'
[maʁrib]	[magrɛb]	Maghreb	'Maghreb'
[ʁazæ:l]	[gazɛl]	gazelle	'gazelle'

One might wonder why the uvular fricatives, unlike other consonants with a Pharyngeal node, are adapted in Arabic loanwords in French, instead of being deleted, as is the case of pharyngeals and laryngeals. The answer is that uvular fricatives, unlike pharyngeals and laryngeals, have an articulator that is available in French, namely the Dorsal articulator. The Pharyngeal node is not their sole articulator. Since, on the one hand, the Dorsal node can also be dominated by the Oral node, as seen in (13a), and since, on the other, the Pharyngeal node cannot be phonologically treated in French, an Oral node is generated, as in (28). This intermediate node is generated according to a widely accepted principle in standard generative phonology, the Node Generation Convention, proposed by Archangeli & Pulleyblank (1994).[22]

(28) a. χ → k



b. ʁ → g



The uvular fricatives of Arabic are thus passively converted to velar stops, /k/ and /g/, the only dorsal consonants of French. The transition in status from fricative to occlusive does not entail any further modification of the structures in (28). The feature [continuant] is not required to distinguish uvular fricatives from occlusives, given that uvulars are the only consonants for which the Pharyngeal node dominates both Dorsal and [RTR]. The Dorsal node of the uvular stop /q/ is dominated by the Oral node exclusively, as we will see in (39). Consequently, [+continuant] does not need to be dissociated from the representation of the uvular fricatives in order to derive the velar stops.

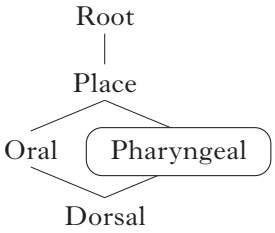
As mentioned previously, the uvular fricatives of some Arabic dialects

[22] 'A rule or convention assigning some F-element α to some anchor β creates a path from α to β' (Archangeli & Pulleyblank 1994: 23).

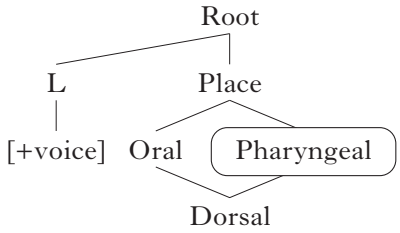
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correspond to velar fricatives in others. Indeed, our Moroccan Arabic consultants often produced velar fricatives. If the velar fricatives are merely phonetic variants of what are, phonemically, uvulars, then their velar articulation is of no concern here. However, even if the velar fricatives were phonemic, this would pose no problem. For one thing, velar fricatives are not opposed to uvular fricatives in Arabic, as previously noted. Secondly, the authors who consider the pertinent Arabic fricatives as being velar rather than uvular note the same adaptations. Indeed, Leslau (1997) reports occlusivisation as being the main adaptation of the Arabic velar fricatives in Afar, a language without velar fricatives of its own (e.g. Arabic [xaatam] → Afar [kaatum] 'ring', Arabic [ɣalaa] → Afar [gala] 'high cost'). The same pattern of adaptation is found in Guinea Fula (/x/ → /k/: e.g. Arabic [xabaru] → Fula [kabaaru] 'news'). The adaptation /g/ → /ɣ/ is not attested, but according to Diallo (1992: 201–202), this absence is explained by the fact that the voiced velar fricative /ɣ/ is first adapted as /x/, an importation among the intellectuals schooled in the Koran. Imported /x/ is subsequently adapted as /k/ in less educated speech. For example, Arabic [ʃuɣla] → Fula [soxola] (the intellectual pronunciation) → [sokola] (the ordinary pronunciation) 'worry'. Furthermore, Arabic loanwords are not the only source of the adaptation /x/ → /k/. The voiceless velar fricative of German is also adapted as /k/ in French, e.g. German *Bach* [bax] → French *Bach* [bak] 'the name of the composer', German *mach* [max] → French *mach* [mak] 'speed in relation to sound'. The same adaptation /x/ → /k/ is seen in English, e.g. Scottish *loch* [lɔx] → English [lɑk]. Indeed, the two examples just cited for French are adapted similarly in English, e.g. German *Bach* [bax] → English [bɑk] and German *mach* [max] → English [mɑk]. The adaptation of the velar fricatives into velar stops is even simpler than the adaptation of uvular fricatives. As we see in (29), the non-treatment of the Pharyngeal node of velar fricatives naturally yields /k/ and /g/, which, as we saw in (28), have only a Dorsal node dominated exclusively by the Oral node.

(29) a. x → k



b. ɣ → g



Finally, the velar and uvular fricatives are not the only consonants with a Pharyngeal node to be adapted in French. This also happens to the uvular stop /q/, as shown in (30).

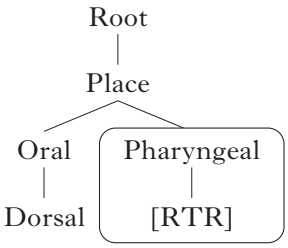
(30) *Adaptation of the guttural* /q/ *in loanwords in French*[23]

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a.	*Arabic*	*French*		
	qâid	[kaid]	caïd	'big chief'
	qîrât	[kara]	carat	'carat'
	qaçaba/qaçba	[kazba]	casbah	'casbah'
	qoton	[kɔtɔ̃]	coton	'cotton'
	qali	[kali]	kali	'a kind of plant'
b.	*Turkish*			
	qalpâq	[kɔlbak]	colback	'a kind of hat'

In Rose's (1996: 80) model, the guttural /q/ is represented with a Dorsal node under the Oral node, and the feature [RTR] under the Pharyngeal node. Thus, the surface adaptation /q/ → /k/ is as shown in (31).

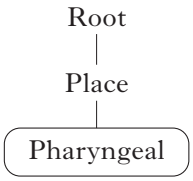
(31) q → k



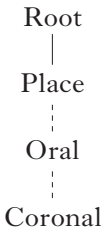
As in the case of Arabic velar/uvular fricatives in French, the Pharyngeal node (this time with dependent [RTR]), is phonologically inert. However, the remaining Dorsal node is phonologically interpretable, characterising /k/, a phoneme of French.

Let us now consider why not being able to phonologically manipulate the Pharyngeal node of a laryngeal, such as /h/, shown in (32a), blocks the realisation of the segment entirely in languages like French, Italian and Portuguese. The answer is simply that these consonants have no other phonologically treatable articulator. One might ask why such sounds do not, then, receive a default Coronal articulator according to the redundancy rule in (16), whose application to /h/ is schematised in (32b).

(32) a. h



b. *h → t



[23] These transcriptions are based on those provided in *Le Robert* dictionary.

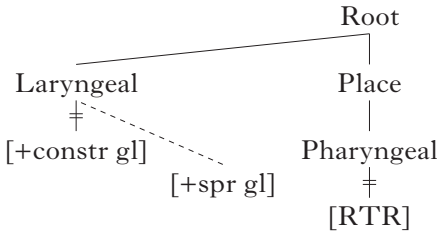
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The answer is that the Pharyngeal node, despite being phonologically unmanageable, still represents an articulatory specification. The Non-availability Principle rules out adding anything to the Pharyngeal articulation, or deleting it to make way for a default Coronal articulator. Thus, an unavailable primitive blocks the application of a redundancy rule that might otherwise apply if the primitive could be removed from the representation. Default and redundancy rules apply to unspecified slots, not those already filled with material. In (28), the Oral node was generated because Dorsal, a phonologically active articulator in French, was already present in the representation of the uvular fricatives, and because Dorsal can be a dependent of the Oral, as well as of the Pharyngeal node. This is not the case with Coronal. Thus not being able to acquire a native articulator in languages which do not employ the Pharyngeal node, the laryngeals and pharyngeals cannot be replaced by other sounds. Having nothing to work with, phonologically, results in the deletion of sounds whose sole articulator is Pharyngeal (with or without dependent [RTR], needless to say). They are considered irretrievably ill-formed. The velar fricatives /x/ and /ɣ/ and the uvulars /χ/ and /ʁ/, as well as the uvular stop /q/, are interpretable in French because they contain a Dorsal articulator, a primitive available in French, as in the vast majority of languages, if not all. These consonants, having a place of articulation already employed in the borrowing language, can thus be realised in the form of a native segment.

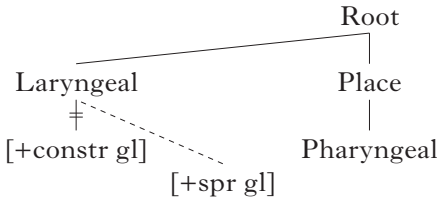
The same reasoning holds in the case of [RTR], which is not an available primitive in Fula. However, its presence does not block the interpretation of the Pharyngeal articulator, which is an available primitive in Fula. Recall that Fula has laryngeals /h/ and /ʔ/, i.e. Pharyngeal node consonants, in its own inventory. The deletion of a segment containing an unavailable primitive *vs.* its adaptation (e.g. /h/ → ∅ in French *vs.* /ħ/ → /h/ in Fula, English and Amharic) depends on what the unavailable primitive deprives the foreign segment of at the moment of its adaptation. So far we have focused on place features, but the availability *vs.* non-availability of laryngeal features also has a role to play. Consider, now, the reasons behind the *de facto* deletion of both /ʕ/ and /ʔ/ in Arabic loanwords in English. As said previously, there are both phonetic and phonological reasons for characterising /ʕ/ as well as /ʔ/ as [+constricted glottis]. Thus, if (Arabic) /ʕ/ and /ʔ/ were adapted to (English) /h/, adaptations would have to proceed as shown in (33a), where [+constricted glottis] and [RTR] are both delinked from the structure; [+spread glottis], which is a default feature for the laryngeal /h/ in English, would be subsequently inserted as in (33b).

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(33) a. ʕ → h

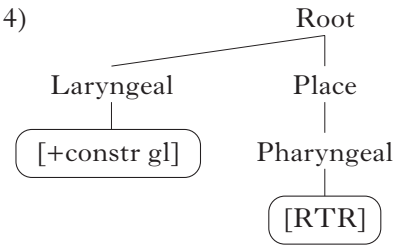


b. ʔ → h



However, neither [+constricted glottis] nor [RTR] can be treated phonologically, i.e. deleted, in English, since neither of them is an available primitive in that language, as illustrated in (34).

(34)



The presence of inert [RTR] alone would not prevent the segment from being interpreted but that of [constricted glottis] blocks the insertion of [+spread glottis], which is integral to the specification of /h/. The glottis cannot be simultaneously constricted and spread, presumably a universal physiologically based restriction. The specification of /h/ as [+spread glottis] is generally assumed, but it is important to note that it is independently required for English, to account for the identical distributional restrictions on /h/ and aspirated stops in English (see Davis 1999). Already having a glottal specification, albeit one that is unavailable to English, the /ʕ/ and /ʔ/ cannot acquire [+spread glottis], thus preventing adaptation to /h/ and leading to non-realisation in loanword adaptation.

The deletion of segments is rare in our corpus (3·5 %, as seen in Table I), because cases of unavailable primitives are, on the whole, rare. One finds them principally among the gutturals which are cross-linguistically

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infrequent consonants. As Delattre (1971: 131) says, 'Pharyngeal consonants [uvulars, pharyngeals and laryngeals in Delattre's terms] are considered to be unusual speech sounds. Not all languages use them and those that do have very few of them'. Most of the time segmental malformations result from what a language considers an inappropriate combination of features, and not from the presence of an unavailable node or feature (see the case of English /ŋ/ → French /ɲ/, as discussed in the introduction).

However, tones and stress can constitute unavailable, and thus untreatable, primitives. The Non-availability Principle in (25) accounts not only for the elision of pharyngeals and laryngeals in languages, such as French, Italian and Portuguese, which lack a Pharyngeal node, but also the systematic deletion of lexical stress in English loanwords in French. While distinctive lexical stress is adapted or imported in English loanwords borrowed into Mexican Spanish (see Fecteau 1998), it is systematically deleted in French. From the perspective of the Non-availability Principle, this is predictable, given that French does not have distinctive lexical stress, while Spanish does. The lexical stress of English, then, also constitutes an unavailable primitive in French – just as tones do when they occur in words borrowed by non-tonal languages.[24]

One might wonder how speakers deal with untreatable phonological elements, such as in sounds characterised by the Pharyngeal node. Crucial here is the distinction introduced in §2 between active (on-line) adaptation, that is to say the adaptation which occurs when a borrower introduces a loanword into the language, and PASSIVE (off-line) use. The same loanword is not adapted every time it is used. A loanword used throughout the population is produced off line, which is to say that its original form (the word as it occurs in the source language) is generally irrelevant. This is not true for those who do the on-line borrowing and adapting. As shown in Grosjean (1982), Poplack *et al.* (1988), Adalar & Tagliamonte (1998), Samar & Meechan (1998), LaCharité & Paradis (2000), etc. borrowers are bilingual, and consequently have access to two phonological codes, namely that of the source language and that of the borrowing language (recall the case of /x/ importation in Fula, used by those schooled in the Koran, as discussed in §5; the importation is introduced by Fula–Arabic bilinguals). The issue of NON-TREATABILITY stemming from the Non-availability Principle plays a role only at the moment of a loanword's active adaptation, which is generally effected by a bilingual in one fell swoop. The rest of the population only uses the loanword, as it has been adapted by the bilingual borrower, and accepted by the bilingual group or environment. Non-bilingual speakers who hear a loanword for the first time – which is already largely or totally adapted – posit the simplest

[24] English lexical stress is deleted in words borrowed into French, e.g. *fresh hot-dog*, [fréʃhátdàg], which yields French *hot-dog frais* [ɔtdɔg frɛ́], where the distinctive stress pattern of English *hot-dog* is simply removed altogether. Stress in French is purely phonetic, falling predictably on the last syllable of the phrase.

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underlying form possible from the surface representation. That representation excludes untreatable primitives, which receive no phonetic representation. It is such a reanalysed representation which forms the basis for passive use (see Paradis & LaCharité 1997 for a more in-depth discussion).

The Non-availability Principle was first motivated by the parallels seen in the results obtained by Brown (1997) and LaCharité & Prévost (1999) and the seemingly unexpected deletions found in loanword adaptation. If we place the acquisition findings within the context of the Non-availability Principle, it means that a segment which consists of a novel combination of features independently active in L1 will be learned far more easily than one that contains an unavailable primitive. Although there are important differences between L2 learners, who speak an interlanguage, and borrowers, whose mastery of L2 is more advanced (the constancy of adaptations in loanwords bears witness to that), these acquisition data show that a non-native segmental contrast based on unavailable features, as opposed to a contrast based on available ones, is significantly more difficult to master (in Brown's view is unlearnable). For our part, we propose, based on results presented in §§4–6, that a non-native (unavailable) primitive cannot be treated phonologically, in the course of adaptation. In fact, both studies show, one on the basis of L2 acquisition, the other on the basis of L2 segment adaptation, that non-native segments are not equally problematic from the point of view of L1. Certain foreign sounds pose more difficulty than others, both for L2 learners and for borrowers.

The concept of non-availability should not lead us to conclude that unavailable primitives or the foreign sounds containing them are not phonetically perceived by the borrowers themselves. We maintain that the borrowers who introduce loanwords into the language perceive such primitives, even though, in line with the Non-availability Principle, they are unable to adapt them. Our argument is twofold. First, if a foreign primitive were not perceived, then it would not block the application of default rules. If, for example, the Pharyngeal node of /h/ were unperceived, then why would /h/ not become adapted as /t/, /s/, /ʃ/ or some other segment? In other words, why is /h/ completely deleted rather than replaced, particularly in view of the (cross-linguistic) preference for syllables with an onset consonant? Second, if borrowers could not perceive foreign primitives, then how could imports containing them be explained? For example, how could we explain the importation of laryngeal /h/, which contains the unavailable primitive Pharyngeal? As seen in Table II, /h/ is imported in 12·8 % of the cases in MF and /ħ/ in 16·1 % of the cases in our targeted database of Arabic loans in French as seen in Table VI. As seen in Table V, English /h/ is also imported in 14·9 % of cases in our targeted corpus of English loans in Portuguese. As for English, [+constricted glottis] /ʕ/ and /ʔ/ are imported in 22·2 % and 21·4 % of the cases, respectively, in our targeted database of Arabic loans in English presented in Table VII. This second argument against the theory of non-

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perception is difficult to refute (for further arguments against non-perception, see Paradis & LaCharité 1997 and LaCharité & Paradis 2000).

7 The permanence of the Pharyngeal node in the representation of laryngeals

Before concluding, let us highlight a theoretical consequence that follows from the proposed analysis. As previously mentioned, Rose (1996) and McCarthy (1991, 1994) both agree that the Pharyngeal articulator is available for the representation of laryngeals. However, neither maintains that the Pharyngeal articulator is universally present in their representation. Both Rose and McCarthy accept that in certain languages laryngeals may be represented as proposed by Steriade (1987a), which is to say they may be unspecified for a place of articulation. The conditions under which underspecification occurs are not the same for both Rose and McCarthy, though. According to McCarthy (1991, 1994), the underspecification of laryngeals is arbitrarily established by a language. In Rose's (1996) view, a laryngeal receives a pharyngeal specification when it is in opposition to one or more other gutturals in a language:

> I argue that, in fact, the representation of laryngeals is intrinsically tied to the range of guttural consonants in a given language. Laryngeals are specified as Pharyngeal only when pharyngeals or uvular continuants are also present in the inventory of the language; otherwise, they are Placeless. (Rose 1996: 73)

Consequently, in Rose's view, the English laryngeal /h/ should not have a Pharyngeal articulator, since it is not phonologically opposed to another guttural in the language (the glottal stop not having phonemic status in English). Although appealing for the predictability it offers, we can see that Rose's hypothesis is incompatible with the results discussed in §§4 and 5. If /h/ had no place of articulation in English, then how could we explain its adaptation by languages which employ the Pharyngeal node (including Spanish, Bulgarian, Catalan, Mandarin Chinese, Greek and Russian) and its deletion by languages which do not (such as French, Italian and Portuguese)? If English /h/ lacked a Pharyngeal node, it ought to be deleted irrespective of whether or not the borrowing languages have any Pharyngeal node consonants in their native phonological inventories. Moreover, if English /h/ were unspecified for a Pharyngeal articulator, then how could its behaviour be linked to the behaviour of pharyngeals in words borrowed from Arabic into French? For the laryngeal /h/ to be identified as a member of this class of posterior consonants in the target language, it must have an articulatory specification to that effect. These facts show that Rose's hypothesis makes predictions which are not verified by loanword adaptations. The regularity of the behaviour of gutturals in loanwords suggests, instead, that the Pharyngeal node is a permanent aspect of the representation of English /h/, even though it is the only pharyngeal sound of the language.

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McCarthy's position that the specification of the Pharyngeal articulator in laryngeals is parameterised may offer a solution to the problem. Perhaps English responds 'yes' to the option of specifying its (albeit lone) laryngeal with a Pharyngeal node. On the other hand, it could also be that laryngeals always have a specified place of articulation. Indeed, some of the arguments for the underspecification of laryngeals have already begun to be reconsidered. One of the most important arguments for underspecification comes from their transparency to vowel harmony (see Steriade 1987a). However, as Rose (1996: 106) points out, this type of argument should be revisited in the light of the reanalysis by McCarthy (1991, 1994). The fact that laryngeals are often epenthetic sounds has also often been used as an argument in favour of their underspecification. However, as Rose (1996: 108) also observes, laryngeals are epenthetic segments even in languages where they are considered to be specified for a Pharyngeal node. Clearly, the traditional arguments in favour of the placelessness of laryngeals need to be reconsidered before we conclude that parameterisation is a better alternative to Rose's (1996) position than permanent specification.

8 Conclusion

We showed that /h/ is the only segment within the nine corpora of loanwords presented in Table I which can be systematically deleted in a given language, namely French. Moreover, the deletion of /h/ cannot be explained by the Threshold Principle, which generally handles the rare segment deletions of our database (3·5 %), since /h/ is not included in an ill-formed higher-level constituent, as in the other deletion cases.

To explain the exceptional behaviour of /h/ in French, we considered two alternatives: the Underspecification Hypothesis and the Non-availability Hypothesis. Under the former, laryngeals are universally placeless, which explains their general tendency to delete whereas, under the later, it is the non-availability of their Pharyngeal node which is problematic in languages with no Pharyngeal node consonant.

Our results confirm the Non-availability Hypothesis insofar as English /h/ is deleted only by languages such as French, Italian and Portuguese, which have no Pharyngeal node consonants. English /h/ is not deleted by languages such as Spanish, Bulgarian, Catalan, Mandarin Chinese, Greek and Russian, which have one or more native pharyngeal node consonants (/x/ or /χ/). In these languages, the laryngeal /h/ is adapted as a velar or uvular fricative, /x/ or /χ/, according to the nature of the available Pharyngeal node consonant.

These facts are incompatible with the Underspecification Hypothesis. Even if we were prepared to accept as merely coincidental the links between the deletion of a guttural and the availability of the Pharyngeal articulator in a language, we would still have to admit that, in some languages at least, laryngeals must be phonologically specified for a

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Pharyngeal articulator. If not, we would be unable to explain their adaptation into other Pharyngeal node consonants. These facts also call into question the idea that, universally, the Pharyngeal node of laryngeals is unspecified if there is not other guttural within an inventory, since English /h/ is systematically adapted in languages with a Pharyngeal node consonant but deleted in the others. The links between the loss of a guttural and the availability of the Pharyngeal node in languages which have borrowed from English logically imply that the English laryngeal /h/ is phonologically specified with a Pharyngeal node, even though it is the only guttural in the English inventory.

The facts presented in this article take us further still. According to underspecification, /h/ ought to be the only guttural to be systematically deleted in French, since placelessness is the hallmark of laryngeals, not pharyngeals. However, we have shown in §4 that the pharyngeals /ħ/ and /ʕ/ are also systematically deleted in Arabic loanwords borrowed into French. In §5, we further demonstrated that, as predicted by the Non-availability Hypothesis, the Arabic gutturals are not routinely deleted in languages which have Pharyngeal node consonants, such as Fula, which has /h/ and /ʔ/, Afar, which has /ħ/ and /ʕ/, Harari, which has /ħ/ and /ʔ/ and Amharic, Argobba and English, which have /h/. However, the case of Amharic, Argobba and English shows that the availability of the Pharyngeal node does not automatically yield the adaptation of any guttural. In those languages, the non-availability of [+constricted glottis] prevents the adaptation of the Arabic [+constricted glottis] pharyngeal /ʕ/ and /ʔ/, whereas the Arabic [−constricted glottis] pharyngeal /ħ/ is systematically adapted.

In view of these results, we encoded the Non-availability Hypothesis in a formal principle and defined a non-available primitive as a non-decomposable phonological unit that a borrowing language cannot handle (modify or delete). It is a kind of phonological white elephant which can be neither deleted nor elaborated. The presence of such a primitive can in some cases block the application of the default and redundancy rules, and thus prevent the adaptation and realisation of the segment. This is the case of the pharyngeal and laryngeal gutturals in languages such as French, and of Arabic [+constricted glottis] /ʕ/ and /ʔ/ in Amharic, Argobba and English.

We agree with the common assumption that foreign segments are adapted in their closest native counterparts. However, we have endeavoured to show in this article that there is a limit to the phonological distance a language is ready to accept between a foreign and a native segment, and that this limit is readily encoded by the Non-availability Principle in loanword adaptation, as in second language acquisition.

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Appendix

List of potential English loanwords presented to consultants[25]

hair conditioner	[hɛɹkəndɪʃənəɹ]	heavy	[hɛvi]
hair spray	[hɛɹspɹe]	heavy metal	[hɛvimɛɾəɬ]
hairy	[hɛɹi]	helper	[hɛɬpəɹ]
half	[hæf]	highball	[hajbɑɬ]
halfback	[hæfbæk]	high fi	[hajfaj]
hall	[hɑɬ]	high-level	[hajlɛvəɬ]
Halloween	[hælowin]	high life	[hajlajf]
hallway	[hɑlwe]	high school	[hajskuɬ]
hamburger	[hæmbəɹgəɹ]	highway	[hajwe]
hand	[hænd]	hippie	[hɪpi]
handball	[hændbɑɬ]	hit	[hɪt]
handicap	[hændikæp]	hit-and-run	[hɪʔn̩ɹʌn]
handmade	[hændmed]	hit parade	[hɪtpəɹed]
hanger	[hæŋəɹ]	hobby	[hɑbi]
happy end(ing)	[hæpiɛnd]	hockey	[hɑki]
happy hour	[hæpijawəɹ]	hold up	[hoɬdʌp]
hard disk	[hɑɹddɪsk]	Hollywood	[hɑliwʊd]
hard rock	[hɑɹdɹɑk]	home run	[homɹʌn]
hardware	[hɑɹdwɛɹ]	hot-dog	[hɑtdɑg]
hat	[hæt]	hotel	[hotɛɬ]

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[25] The list of words was first presented in writing to our consultants, who indicated those that were known to them. The list was then removed. We subsequently used short definitions, corresponding to the meaning of the known loanwords, to prompt consultants to provide the loanwords they knew in the context of a short sentence in their mother tongue. Their responses were tape-recorded and subsequently transcribed in IPA symbols.

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