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A TALE OF TWO CITIES: LONDON GLOTTALLING AND NEW YORK CITY TAPPING

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1 INTRODUCTION*

The focus of this paper is a class of lenition phenomena which has been characterised as 'metrical-domain-internal' by various authors. Specifically, we will be looking at glottalling of *t* in London English (as in *ci[ʔ]y*, *cu[ʔ]*) and tapping in New York City English (as in *ci[ɾ]y*). Our analysis, which is formulated within the framework of Government Phonology (Kaye, Lowenstamm & Vergnaud 1985, 1990), is founded on two main assumptions. Firstly, all reduction processes including glottalling and tapping are to be represented directly as the loss of material from the internal structure of segments. Achievement of this goal requires a theory in which phonological oppositions are expressed privatively in terms of univalent atoms or elements. Secondly, a logical connection is to be established between a reduction event, indeed any phonological event, and the context in which it occurs. According to Government Phonology, the source of this connection lies in the relations of government which hold between positions in a phonological string.

Previous metrical approaches to *t*-lenition in English, which we will review briefly, incorporate some aspect of the orthodox rewrite rule model. Typically, what is proposed in these analyses is some form of lenition rule which is fed by resyllabification. This sort of account is not available within Government Phonology, which lacks anything equivalent to traditional rule formalism and rule ordering. Instead, phonological processes are conceived of as taking place freely in response to parameterised conditions which are locally present in the phonological string. This leads to an extremely restrictive theory of phonological processing. In fact, only two types of operation are possible: composition (the fusion of elements from neighbouring segments) and decomposition (the loss of elements). There is no operation of substitution, in which

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any element could be randomly replaced by any other element not locally present in the representation.[1] One of our aims here is to demonstrate that this radically pared-down model of phonological activity is still able to account for all the facts of *t*-lenition in English.

Our presentation proceeds as follows. We begin in Section 2 with some background observations on the social and geographical distribution of *t*-lenition in English. We continue in 3 with a brief review of previous metrical treatments of the phenomenon. The next two sections outline the main aspects of Government Phonology which feature prominently in our own analysis. In 4, we discuss how a theory of segmental structure in which segments are composed of univalent pronounceable elements allows reduction processes to be expressed directly in terms of element depletion. In 5, we demonstrate how the notion of prime reduction site can be derived from conditions defined by phonological government. Section 6 is devoted to a detailed analysis of three sets of conditions on *t*-lenition: the content of a following nucleus (6.1), the prosodic domain within which *t* occurs (6.2) and the effect of neighbouring consonants (6.3). In 7, we summarise our main conclusions, and in an appendix we consider how some residual recalcitrant data might be treated.

2 GLOTTALLING AND TAPPING

In many types of English, *t* in certain phonological contexts is affected by various lenition processes. Two of the most widespread of these are glottalling and tapping. When **glottalled**, *t* is produced with constricted glottis and no oral closure, as in *ci[ʔ]y, Pe[ʔ]er, cu[ʔ]*. **Tapping**, which also affects *d* and is sometimes referred to as **flapping**, results in a alveolar tap, as in *ci[ɾ]y, Pe[ɾ]er*. The conditions under which these two processes operate overlap to a significant extent, although they vary in interesting ways from dialect to dialect.

Glottalling is firmly established in Britain; tapping occurs in North America, Australia, Ireland and some parts of England. The analysis of *t*-lenition presented in this paper is based on data sets elicited from native speakers of London English and New York City English. We will refer to these sets as deriving from 'the New York City system' and 'the London system'. This is simply a matter of expository convenience and is not meant to imply a belief in the reality of static homogeneous

1 This statement has to be qualified to the extent that it is necessary to recognise the existence of 'ambient' elements. These are elements which are not distinctively present in lexical representations but which, in a language-specific manner, spontaneously appear in certain positions during a derivation. One type of example involves so-called epenthetic vowels which in Underspecification Theory are analysed as maximally underspecified segments (Archangeli 1984). See Charette (in press) for a full discussion of ambient schwa in French.

systems which can be accurately and comprehensively described through the study of the speech of a handful of 'typical' speakers. Within particular geographical areas and even within the speech of individual speakers, *t*-lenition is subject to sociolinguistic variability, with lenited variants tending to be favoured in less standardised varieties and in less formal speech styles. Nevertheless, we suspect that some of the salient facts we set out to analyse here are representative of much wider communities.

3 PREVIOUS ANALYSES

Since Kahn (1976), it has been widely acknowledged that the correct formulation of the conditions on tapping is in terms of syllable structure. It has also been recognised that there is a close distributional relationship between the tapped reflex of *t* and the kind of preglottalised unreleased realisation frequently found, for example, word-finally before a pause or a consonant-initial word (e.g. *ge[ɾ] on* versus *ge[ʔtˀ] by*). (Preglottalisation also extends to non-coronals, as in *ca[ʔp]* and *ba[ʔk]* (with or without release). However for space reasons we limit our discussion to *t*.) Kahn's approach has been adopted and extended to deal with glottalling by David Leslie (1983) and with other aspects of plosive allophony by Gussenhoven (1986). Central to all of these accounts is a rule which modifies structure established by basic syllabification principles (founded on onset maximisation). The resyllabification process (Kahn's Rule III) creates an ambisyllabic context which triggers lenition.

The anomalous nature of ambisyllabic structures has been widely commented on; if accepted, they represent the only case of improper bracketing countenanced by linguistic theory. Kiparsky's (1979) reanalysis of tapping dispenses with the notion by defining the relevant conditions in terms of both syllable and foot structure. His proposal is that *t*'s are first laxed on the word cycle in non-foot-initial position. Post-cyclically, lax *t* is tapped when it occurs syllable-initially (as in *city*) and glottalised when it occurs syllable-finally (as in *bat*). Cross-word instances of tapping (as in *get on)* are derived in the following way. A phrase-level resyllabification rule moves an intervocalic consonant out of a coda and into a following onset, a process which is ordered before tapping. Thus the *t* in *get* is first laxed when it occurs in non-foot-initial position and then tapped once it is moved into onset position in the phrase *get on*.

Selkirk's (1982) account of tapping also avoids ambisyllabicity but still relies on a resyllabification process to feed lenition. Her proposal is that, under certain stress and segmental conditions, a single consonant assigned to an onset by basic syllabification is detached from that position and adjoined to the coda of a preceding syllable. The distributional relationship between tapping and glottalisation is captured by specifying syllable-final position as the context in which both occur. The

complementarity of the two processes is established by invoking the feature contrast [±release], with the plus value triggering tapping.

All of these analyses incorporate one or more of the following: resyllabification, ambisyllabicity and rule ordering. It is incumbent on us to show how the lenition facts can be accounted for without recourse to these devices, since none of them is available within the Government framework. However, one precedent set by previous analyses which we will follow is to capture the distributional relationship between tapped and unreleased reflexes of *t* by breaking the lenition process into two stages.

4 SEGMENTAL DECOMPOSITION

Our first task is to specify how lenition processes such as glottalling and tapping are expressed directly in terms of segmental decomposition. The theory of segmental stucture we will be assuming here is based on that outlined by Kaye, Lowenstamm & Vergnaud (1985, 1990) (henceforth KLV 1985, 1990).

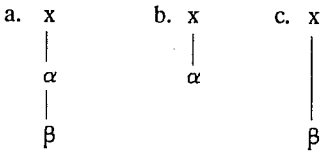
The ultimate constituents of segments are elements. In keeping with the assumption that all phonological oppositions are expressed privatively, these are univalent. Moreover, each element is fully specified for a number of phonetic attributes, one of which constitutes its marked or salient property. The full phonetic identity of an element manifests itself whenever it occurs as the sole component of a simplex segment. For example, the salient property of the element ʔ° is a significant reduction in overall amplitude in the speech signal, such as is achieved by a radical constriction in the oral cavity. Its unmarked properties include an absence of resonating characteristics, which is consistent with an absence of any supralaryngeal gesture. Independently, the element is thus pronounced as a glottal stop. The element R° is individually manifested as a tap; it has coronality as its salient property and a tapped articulation as one of its unmarked attributes.

Elements may combine to form compound segments. The outputs of such combinations are determined by fusion operations, each of which involves two elements, one defined as the head of the fused expression, the other as the operator. Under fusion, the salient property of the operator overrides any property on the same phonetic dimension possessed by the head; all other properties are contributed by the head. Thus combining ʔ° and R°, with the latter as the head, yields a segment which is both coronal (contributed by R°) and a stop (the salient property of ʔ°).

Two aspects of element structure combine to provide a natural means of characterising segmental reduction: univalency and fully specified content. The univalent nature of elements enables us to express

reduction directly as segmental decomposition – the loss of material from the internal structure of a segment. Partial decomposition of a segment containing two elements α and β (1a) results in either (1b) or (1c).

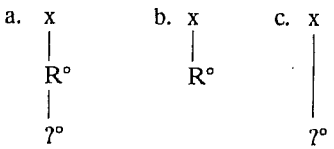
(1)



The second aspect of elements, their fully specified nature, has a bearing on the issue of how best to capture the notion of prime reduction segment. The segments which crop up again and again as the pre-deletion outputs of such reduction processes as vocalisation or debuccalisation are *w, y, r, ʔ, h*. In orthodox feature frameworks, a change such as *s* ⟶ *h* involves at least one supplementary redundancy rule which spells out the lenited output as glottal. Such rules are in principle arbitrary, since there is no intrinsic reason why this particular redundant value should be more favoured than any other value (labial, for example). (See Harris 1990 for discussion.) In element theory, the 'primitiveness' of the classic reduction targets follows from the fact that they are simplex segments containing single pronounceable elements.[2] Each of these elements thus automatically defines a particular residual segmental content whenever other elements present in an initial representation are stripped away under reduction.

To see how this element-based approach to lenition works in more detail, let us take a generic coronal stop (2a):

(2)



(For the sake of the present discussion, we can ignore the source elements which distinguish obstruents along the laryngeal dimension.) Representationally, partial reduction of the compound structure to a simplex can take one of two routes: either ʔ° or R° is lost. In the first instance, we are left with R°, which independently defines a tap (2b). In the second, we are left with ʔ°, which independently defines a glottal

2 The elements which individually define the 'primitive' reduction consonants are (together with their salient properties and the phonetic values they manifest in simplex segments): I° (palatal, [y]), U° (labial, [w]), h° (narrowed, [h]), ʔ° (occluded, [ʔ]) and R° (coronal, [r]).

stop, as in (2c). Tapping and glottalling are thus identified as the loss of particular elements from the internal composition of a stop.

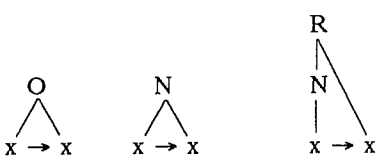
5 PRIME REDUCTION SITES

We turn now to the issue of why there exist certain phonological contexts which, more than others, favour glottalling and tapping in particular and lenition in general. In Government Phonology, environmental preferences of this sort derive from the governing relations which hold among positions in a phonological string. In order to develop this point in more detail, we need to outline the theory of phonological government which our analysis presupposes. (See KLV 1990 and Charette (in press) for more detailed presentations of the theory.)

Phonological government defines the conditions under which positions in a phonological string can be viewed as adjacent. We begin with the assumption that, within a given domain, all phonological positions save the head of the domain must be licensed. Government, which is one instantiation of licensing, operates at three levels of structure: within syllabic constituents (constituent government), between contiguous syllabic constituents (interconstituent government) and between the nuclear heads of constituents (government at the level of nuclear projection). Relations at the first two levels are strictly local and strictly directional, head-initial in the case of constituent government, head-final in the case of interconstituent government.

The theory recognises three syllabic constituents: Onset, Nucleus and Rhyme. The requirements of strict locality and left-headedness define the following maximal constituent structures (where the arrow indicates the direction of government):

(3)

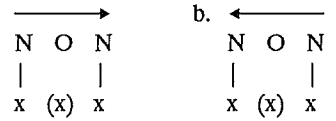


Strict locality together with right-headed directionality defines a number of interconstituent domains. Of these, the relation between an onset and a preceding rhymal complement will figure in the following discussion:

(4)

Governing relations at the level of nuclear projection are local but not strictly local. That is, nuclear positions forming a governing domain are required only to be adjacent on that projection, even if the skeletal positions they dominate are not adjacent. Directionality at this level is parametrically variable. The following configurations illustrate respectively left- and right-headed government at the level of nuclear projection:

(5) a. b.



Various types of phonological phenomena occur in response to the conditions defined by phonological government. At the level of nuclear projection, for example, harmony, syncope, stress and tone effects all follow lines of government. The question of immediate relevance here concerns the role phonological government plays in triggering reduction processes.

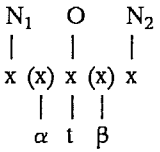
Our principal hypothesis is that the connection between a reduction event and local governing relations is established via the notion of segmental complexity. Complexity, which is simply calculated as the number of elements of which a segment is composed, is one of the determinants of a segment's governing capacity.[3] According to the Complexity Condition (KLV 1990, Harris 1990), a segment occupying a governed position cannot be more complex than its governor.

One particular complexity effect which we will be discussing here manifests itself whenever a segment is attached to a position which intervenes within a governing domain. Under these circumstances, the segment constitutes a potential 'barrier' to government and comes under pressure to decomplexify. Formally the configuration in question can be characterised in the following way: if there are differences in the ability of nuclei to license onset segmental material within a given system, then a governing nucleus always possesses greater segmental licensing power than a licensed one. We expect, then, that the set of onsets permitted by the former will include segments of a greater degree of complexity than is possible with the latter.[4] Just this sort of situation arises when

3 The other determinant of a segment's governing capacity is the charm value of its head element (see KLV 1985, 1990). Concretely, any governed segment must be **charmless**. A governor may be charmed or charmless, but if charmless, must have a complexity equal to or greater than that of its governee. Since, as discussed in KLV (1990), negative charm is associated with the laryngeal elements, stops and fricatives not possessing these elements are neutrally charmed and hence governable.

4 The notion of 'barrier' is not a deterministic one. It characterises possible lenition sites but does not **require** that lenition take place at these sites. **Lenition site** is part of UG and accordingly not subject to parametric variation. Whether or not lenition does in fact take place is, on the other hand, a matter of parametric variation.

a consonant occupies an onset position between two nuclei which form a governing domain (at the level of nuclear projection). This configuration represents the prime reduction site where both glottalling and tapping (and other lenition processes) take place (internuclear government in English is left-headed):

(6)


6 CONDITIONS ON *T*-LENITION

6.0 Introduction

Specifying the conditions on *t*-lenition in more detail will involve us in discussing three aspects of the structure shown in (6): (a) the content of N_2, (b) the nature of the prosodic domain defined by the relation between N_1 and N_2, and (c) the effect of other consonants (α or β in (6)) which may intervene between *t* and either of the flanking nuclei.

Before examining each of the three sets of conditions on lenition in detail, let us note the main context in which tapping and glottalling are never attested in our data. Neither system displays lenition when *t* occupies the onset of a tonic syllable:

(7)

	NYC	r	Lon	ʔ	
	*		*		ten, retain, entertain

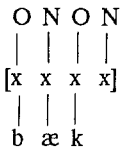
(When a word contains more than one orthographic <t>, the emboldened letter indicates the *t* which occurs in the phonological context exemplified by that particular set of words.) In this context, *t* does not occur within a governing domain and is thus not susceptible to decomposition.

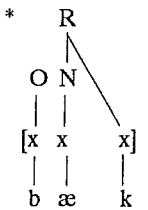
6.1 Content of the governed nucleus

One of the conditions on phonological government which will figure in our discussion of the governed-nucleus context is the 'Coda' Licensing Principle (Kaye 1990):

(8) **'Coda' Licensing**
A post-nuclear rhymal position must be licensed by a following onset.

Under this principle, a domain-final consonant is universally syllabified in an onset position followed by an empty nucleus (as in (9a)). The structure (9b), in which a domain-final consonant occupies a rhymal complement ('coda') position, is illicit.

(9) a.


b. *


One justification of this principle is that it enables us to distinguish two independent parameters which differentiate among syllabic systems. In line with most current thinking, the traditionally recognised difference between 'CV' and 'CVC' languages is expressed in terms of whether the system permits branching rhymes. However, cutting across this difference is the distinction between systems which do and those which do not permit domain-final consonants. The latter is expressible in terms of whether the system licenses domain-final empty nuclei (as in (9a)). (See Kaye 1990 for a fuller discussion of this issue.)

Of immediate relevance to the present discussion is the point that 'Coda' Licensing allows us to unify two contexts in which lenition frequently operates simultaneously. Informally, we can characterise these as intervocalic position (usually supplemented by some kind of stress condition) and word-final position. In previous analyses of *t*-lenition (e.g. Kahn 1976, Selkirk 1982), basic principles of syllabification ensure that consonants in these contexts start out by being assigned to distinct syllabic positions, namely onset and coda respectively. The unification of the contexts is then achieved by resyllabifying an intervocalic onset consonant into the coda of the preceding syllable and by identifying coda position as part of the lenition trigger. From the perspective of Government Phonology, resyllabification implies a restructuring of existing governing relations, something which is ruled out by the phonological implementation of the Projection Principle (KLV 1990):

(10) **Projection Principle**
Governing relations are defined at the level of lexical representation and remain constant throughout a phonological derivation.

In the Government framework, the intervocalic and domain-final lenition environments are unified under (6). What distinguishes them is the content of N_2: in the case of the intervocalic context, the nucleus is phonetically realised; in the case of domain-final position, the nucleus is empty under 'Coda' Licensing. Note that this unification holds at all stages of a derivation; there is nothing analogous to the rule ordering arrangement inherent in other analyses whereby resyllabification feeds lenition.

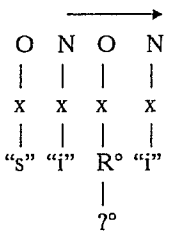
Let us first consider the filled nuclear context, where the relation between N_1 and N_2 defines a metrical foot. In this case, both of our dialects show lenition of *t*, irrespective of whether the dominant syllable of the foot bears primary (11a) or secondary word-stress (11b):

(11)

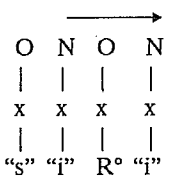
	NYC ɾ	Lon ʔ	
a.	√	√	city, pretty, water, automatic
b.	√	√	automatic, photographic

In representational terms, *t* decomposes when it occupies an onset position sandwiched between nuclei in a governing relation, where the governed nucleus is phonetically realised, e.g:

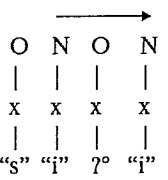
(12) a. *city*



b. **Tapping**



c. **Glottalling**



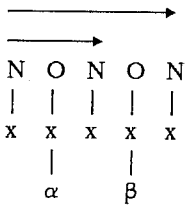
The same pattern manifests itself in extended feet containing two governed nuclei:

(13)

NYC ɾ	Lon ʔ	
√	√	political, sanity, competitor

There are two potential lenition sites here: when *t* occupies either the onset immediately following the governing nucleus (α in (14), as in *political*) or the onset flanked by the two governed nuclei (β in (14), as in *sanity*).

(14)



An interesting observation can be made regarding forms in which both lenition sites in such configurations are occupied by *t*'s. The second *t* can be lenited only if the first is also lenited. In London, for example, we have encountered *compe[t]i[t]ive, compe[ʔ]i[t]ive* and *compe[ʔ]i[ʔ]ive*. The form **compe[t]i[ʔ]ive*, however, appears to be ungrammatical. Parallel results have been obtained for tapping in New York City. We have not been able to check these observations against more extensive data. However, it is worth pursuing the idea that, in structures such as (14), a 'chain' of reduction is set in motion along lines of government.

The dialects diverge with respect to whether lenition applies before a domain-final empty nucleus. Recall that in English domain-final empty nuclei are licensed. Being licensed, they should display similar behaviour to other licensed nuclei. Nuclei in weak metrical position are also licensed, in this instance by virtue of being governed in their foot. As stated above, onsets appearing before licensed nuclei are potential lenition sites. And indeed we find that lenition occurs in both dialects in this position. In this case, New York City shows tapping only if a vowel-initial word immediately follows, as in (15a).

(15)

	NYC ɾ	Lon ʔ	
a.	√	√	cut it, get on, wait on
b.	*	√	cut ‖, get ‖, wait ‖
	*	√	cut back, get by, wait for

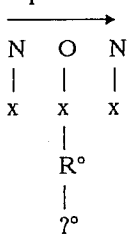
Otherwise, i.e. before a pause (‖) or a consonant-initial word (as in (15b)), we find a preglottalised unreleased [ʔtˀ]. In London, glottalling applies in these cases regardless of the following context.

Let us examine the New York City alternation between tap and unreleased *t* in rather more detail. The pattern shows up both word-internally (e.g. *fi[ʔtˀ] - fi[ɾ]er*) and across word boundaries (e.g. *ge[ʔtˀ] - ge[ɾ] along*). It is even evident when a following word-initial syllable is stressed (e.g. *ge[ɾ] ón*), even though tapping fails to apply in

such stress configurations when they occur word-internally, e.g. **bou[ɾ]ique*. This suggests that the distribution of tap versus unreleased stop is conditioned not by the governing relations of the flanking nuclei but by something else. That something else, we contend, has to do with whether the governed nucleus is empty or filled.

Generally speaking, the sum of the contexts in which New York City has tap and unreleased *t* is equal to the sum of the contexts in which London has glottal stop. In order to capture this distributional relationship, we propose that the dialects share a preliminary process which subjects *t* to lenition in context (6). They differ in the ways in which the lenited structure is subsequently affected by loss of an element. The initial lenition process we have in mind is one in which the elements ʔ° and R° are rearranged into a contour structure parallel to that normally assumed for prenasalised stops, light diphthongs or affricates. We will appropriate the traditional term **breaking** to refer to processes of this type which involve decomposition without element loss:[5]

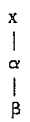
(16) a. Initial representation



b. **Breaking**

Our two dialects diverge in terms of how this intermediate 'broken' *t* is further decomposed. As before, we assume that tapping takes the form of a loss of ʔ°, while glottalling involves loss of R°.

5 Since breaking takes place in lenition sites, we can sharpen our notion of complexity. Clearly breaking does not necessarily entail element loss. However, it does involve a reduction in **fusion**. That is, after breaking, any single phonological expression associated with a skeletal point contains less elements than prior to the breaking process. This can be illustrated as follows:

(i) 

(ii) 

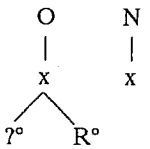
In (i) α and β are fused to form a compound segment. In (ii) breaking has occurred, resulting in a segment with no fusion. Both α and β are attached directly to the skeleton.

Following Kaye (1985), we assume that contour segments such as in (ii) do not involve concatenation. The 'order' of the segment is fixed by UG.

Our main justification for splitting the lenition process into two stages is that the phonological conditions on the two stages can be shown to be distinct. Breaking occurs in the internuclear position (6) already identified as a prime reduction site. Loss of either of the elements is sensitive only to the content of the governed nucleus, i.e. to whether or not it is empty.

(17) **Glottalling/tapping**

Input



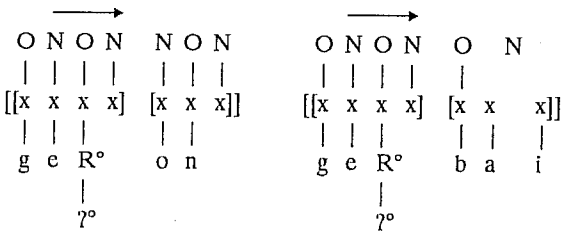
Output

	N empty	N filled
London: R° → ∅	√	√
NYC: ʔ° → ∅	*	√

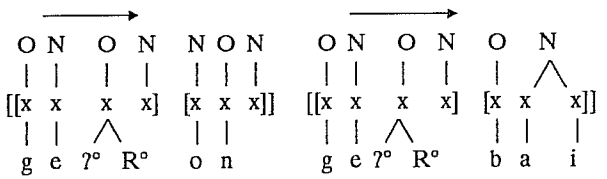
It should not be thought that the intermediate broken representation is some ad hoc and 'abstract' device whose sole motivation is to provide a way of distinguishing two different sets of conditions on lenition. The broken structure in (16b) describes a preglottalised coronal segment which, we propose, corresponds to the preglottalised unreleased realisation of *t* illustrated in (15bc). When released onto a following vowel, it describes a preglottalised tap of a type that is actually attested in some leniting dialects. For example, in some varieties of English spoken in the north of Ireland and the northeast of England, we find pronunciations such as *ci[ʔɾ]y, Pe[ʔɾ]er.*

We are now in a position to offer an account of the alternation between tap and unreleased t. Compare the derivations of *ge[ʔtˤ] by* and *ge[ɾ] on* in (18). On the inner cycle, breaking (16) affects both forms:

(18) a. *get on* *get by*

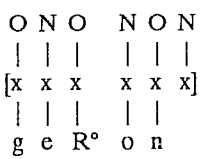


Breaking



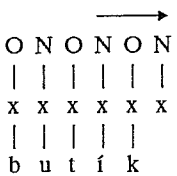
On this cycle the position occupied by *t* is followed by an empty nucleus (present under 'Coda' Licensing). Tapping is thus inapplicable, since, according to the conditions given in (17), it is triggered by the presence of a following filled nucleus. On the next cycle, however, a filled nucleus becomes available in the form *get on*. (Under the OCP, the empty nucleus deletes next to a filled nucleus.) The conditions for tapping are now met, and loss of ʔ° duly occurs:

(18) b. Tapping



In a form such as *boutique*, where *t* is followed by a tautomorphemic tonic syllable, lenition never has the opportunity to take place. This is because, although *t* is followed by a filled nucleus, it never undergoes the initial breaking process (16) which provides the input to tapping. Since *t* occupies the onset position of a stressed syllable, it does not occur within the governing domain necessary for breaking:

(19)



It should be noted that tapping and glottalling in (17) are intrinsically fed by breaking (16), which is fully in tune with the principle that phonological events occur freely whenever their conditions are met.

6.2 Prosodic domain

The level of projection defined by the relation between N_1 and N_2 in (6) plays a significant role in conditioning *t*-lenition. In particular, systems which show lenition in contexts defined by the first-order projection (i.e. within the foot, as in *city*) differ with respect to whether the process can also operate at a higher-order projection (i.e. within the phonological word where the syllable following *t* bears secondary stress). The latter environment covers forms in which the dominant foot preceding *t* is degenerate (as in (20a)) and those in which it is branching (as in (20b)).

(20) a. retail, latex, context, daytime
b. sabotage, meditate, habitat, dinnertime

In this matter, there appears to be a significant interaction between the geographical and social dimensions of variability. Lenited variants above foot level are much more heavily stigmatised in some communities than others. For example, none of our London or New York City informants judged lenition as acceptable in the forms in (20). Nevertheless, we noted sporadic instances of lenited reflexes in this type of context in unmonitored speech. According to Leslie (1983), glottalling is quite normal above foot level in Fife (Scotland).

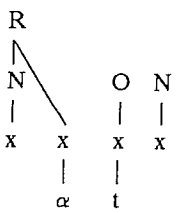
6.3 Protected environments

We turn now to a third condition on *t*-lenition: the potential influence of consonants associated to positions which intervene between the onset slot occupied by *t* and either of the flanking nuclei in (6). Two types of environment are involved here: one in which *t* is followed by a consonant in the same onset (as in *petrol*), and another in which *t* is preceded by a 'coda' consonant, i.e. a consonant occupying the rhymal complement position of a preceding syllable (as in *doctor*).

6.3.1 Preceding 'coda' consonants

We will start by examining the 'coda' context:

(21)



One firm generalisation that we can make about both the London and New York City systems is that lenition never occurs if the preceding rhymal consonant is an obstruent:

(22)		NYC ɾ	Lon ʔ	
	a.	*	*	fist, left
	b.	*	*	fact, apt
	c.	*	*	after, custard
	d.	*	*	chapter, doctor

(When the forms in (22a, b) occur prepausally or preconsonantally they do not constitute potential tapping contexts for New York City anyway, since *t* here is followed by an empty nucleus, cf. the forms in (15b).) The cases in (22) constitute classic examples of a 'protected' environment (Lass & Anderson 1975) in which an otherwise leniting consonant is apparently shielded from the process by a neighbouring segment. This traditional view suggests that the protecting segment is exerting an influence on the protected segment. In the account we offer below, we will claim that the direction of influence is in fact the opposite of this. Specifically, we will claim that *t* fails to reduce in these forms because of the governing responsibilities it has towards the preceding consonant.

If α in (21) is a resonant, there is a certain amount of variability with respect to whether *t* lenites in our two systems. In the case of historical *rt* sequences, whether we are dealing with a rhotic or a non-rhotic system appears to make no difference to the lenition facts. London is categorically non-rhotic; rhoticity in New York City is sociolinguistically variable. In terms of syllabic structure, forms containing non-rhotic reflexes of historical *rt* are identical to those which originally never contained *r*, and the lenition facts line up accordingly. Compare (23a) (following filled nucleus) with (11, 15a) and (23b) (following empty nucleus) with (15b).

(23)		NYC ɾ	Lon ʔ	
	a.	√	√	quarter, starter, forty
		√	√	hurt it, court of, start up
	b.	*	√	hurt ‖, court ‖, start ‖
		*	√	hurt me, court shoe, start them

The New York City pattern in (23a) and (23b) is identical to that in (15a) and (15b) and holds irrespective of whether the rhotic or the non-rhotic variant is used.

Now consider historical *lt* sequences. In London vernacular, the *l* is vocalised to a high back glide in this context, and forms containing this sequence show the same pattern of *t*-lenition as that which is evident in contexts which historically lacked *l*. Compare (24a) and (24b) with (11, 15a) and (15b) respectively.

(24)		NYC ɾ	Lon ʔ	
	a.	*	√	shelter, revolted, Walter
		*	√	fault of, belt up, bolt it
	b.	*	√	fault ‖, belt ‖, bolt ‖
		*	√	fault me, belt buckle, bolt down

Vocalisation of *l* does not occur in New York City, and in this dialect lenition is blocked in this context. The same blocking effect manifests itself in more standardised London speech: whenever vocalisation is avoided, there is a tendency for *t* not to be glottalled, e.g. [bɛw?] vs [bɛɬt] *belt*.

There is a well known tendency for vocalisation to extend to *n* in certain contexts. This usually takes the form of a loss of consonantal closure and a transfer of nasality onto a preceding nucleus. Under these circumstances, historical *nt* sequences tend to behave just like historically non-nasal contexts with respect to *t*-lenition (see (25)). (In New York City, tapping in this context usually results in a nasalised tap, as in [wĩɾə] *winter*.)

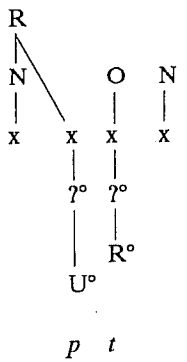
(25)		NYC ɾ	Lon ʔ	
	a.	√	√	winter, plenty
		√	√	print of, paint it
	b.	*	√	hint ‖, paint ‖
		*	√	print some, paint mark

Let us summarise the facts relating to the conditioning of *t*-lenition by an immediately preceding consonant. If the consonant is an obstruent, lenition is categorically blocked. Lenition is favoured if *t* is preceded by a historical resonant, more especially if the latter has undergone vocalisation. In previous analyses of *t*-lenition, distributional facts of this type are simply stipulated by including a segmental condition in the structural description of the lenition rule to the effect that a preceding segment must be [-consonantal] (Kahn 1976, Selkirk 1982) or [+sonorant] (Leslie 1983).

Our analysis of these facts invokes the Complexity Condition, according to which a governed segment is barred from being more complex than its governor. The account can be summed up as follows: governing consonants do not reduce. That is, segments which have governing work to do are immune to processes whose effect is to reduce

their complexity. Condsider the elementary content of the trans-syllabic sequence *pt* in a form like *chapter* (the element U° contributes labiality to *p*):

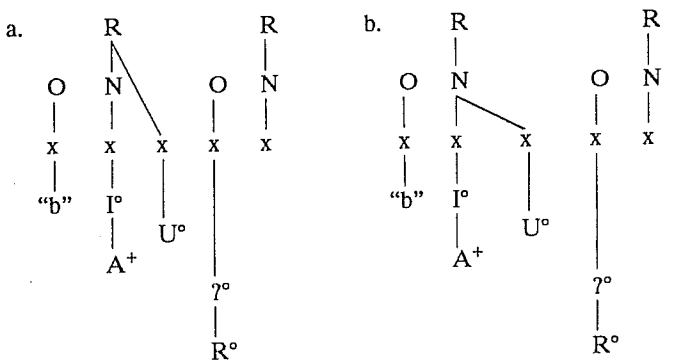
(26)



In this configuration, *t* governs *p* (by interconstituent government). In line with the Complexity Condition, the governed segment is no more complex than its governor. Any decomposition of *t* in this context would have the effect of reversing the complexity slope between the two segments. Hence the failure of lenition in this environment.

In the case of resonant-plus-*t* sequences, the situation is quite different, particularly where the results of vocalisation manifest themselves. Vocalisation, like *t*-lenition, is expressed as the loss of consonantal material from a segment's internal make-up. The result in the case of velarised *l*, for example, is a simplex structure containing the element U°. Structurally, vocalisation of a post-nuclear rhymal consonant produces one of two historical outcomes: the vocalised reflex either retains its rhymal position or becomes absorbed into the preceding nucleus. These two developments are illustrated in (27) which shows the *w* reflex of velarised *l* in *belt* (*e* is composed of I° and A^+):

(27)



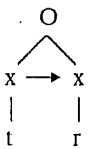
The development responsible for (27b) produces a true (i.e. nuclear) diphthong. In contrast, (27a) shows a fake diphthong, i.e. one in which the off-glide is extra-nuclear.[6] Reviewing all the arguments that would help us decide which of these routes has been followed in English vocalisation is an issue that would take us beyond the scope of this study. For our present purposes, we will simply assume development (27b). Under such circumstances an onset *t* no longer has any governing obligations and is thus susceptible to decomposition.

Why is it that *t*-lenition is favoured in historical *rt* sequences, irrespective of whether *r* has been subject to vocalisation or not? If *r* never occurs in a rhymal consonant position (in English) but rather in the governed **nuclear** position, then a following onset *t* is absolved of its governing responsibilities, as in (27b), and is left open to reduction.[7]

6.3.2 Following resonants

We now examine the behaviour of *t* in potentially leniting contexts when it is followed by a resonant, i.e. in word-internal *tr*, *tl*, or *tn* sequences. The first point that needs to be established about such sequences is whether they constitute genuine clusters in syllable structure. This is not a trivial matter that can be instantly decided by simply inspecting segment strings. The point is underlined when we consider the medial sequence *tr* in English. If this represents an onset, we expect that *t* will be resistant to decomposition, since it has governing work to do, in this case constituent government:

(28)



This in fact is the pattern we found in the speech of our London and New York City informants:

6 Other examples of fake diphthongs containing non-nuclear glides include French *ay*, as in *travay* <travail>, and Dutch *aay*, as in <aai> 'caress (1sg)' (see Kaye & Lowenstamm 1984 and Booij 1989). The onset status of these glides is demonstrated in such forms as *tra.va.ye* (**tra.vay.e*) <travailler>. This behaviour is in marked contrast to the integrity displayed by true diphthongs, e.g. *plaw.in* (**pla.win*) <ploughing>.

7 *r* pssesses the requisite charm and complexity properties enabling it to occur in this position. It is both neutrally charmed and simplex. See KLV (1990) for discussion.

(29) NYC ɾ Lon ʔ
* * petrol, mattress, patrimony

However, we made sporadic observations of glottal reflexes in such words in unmonitored vernacular London speech. Leslie (1983) also reports glottalling as being quite normal in this context in Fife. In these cases, it might seem worth pursuing the idea that reduction of a governing *t* is tolerated next to *r*, given the latter's inherent simplexity. However, it is first necessary to check whether medial *tr* sequences really are onsets.

If the allophony of *t* provides evidence of its position in syllable structure, then in some cases it is clear that medial *tr* cannot be parsed as an onset. Consider, for example, the pronunciation of the word *battery*. In many dialects, an unstressed nucleus is always audible between *t* and *r*; this suggests the syllabification *bæ.tə.rɪ*, which is confirmed by the lenition of *t* in dialects which permit decomposition in this context (cf. the forms in (11)). For many London speakers, the orthographic form *battery* has two distinct pronunciations. *Battery*, as in *car battery*, is pronounced *ba[tr]y* with aspirated *r*; this is the usual pronunciation of *tr* in onsets (as in *tray*) and is the less 'broad' variant noted in (29). The other pronunciation is *ba[ʔr]y* with glottalled *t* and unaspirated *r*, which occurs when the form appears in the phrase *assault and battery* (< *batter*). In some frameworks, *t* in the latter pronunciation would be analysed as being in coda position. This is impossible in Government Phonology; *tr* is ruled out as an interconstituent sequence on the grounds that *r* does not possess the charm or complexity requirements necessary for it to govern a preceding *t*.

The only possible parsing of *ba[ʔr]y* in the Government framework is one in which *t* and *r* occupy onsets separated by an empty nucleus. The latter corresponds to the audible nucleus which we encounter in other dialects. Historically, the difference between the two types of dialect results from the loss of schwa from certain post-tonic positions in the London-type system. The difference is expressible in terms of whether a system licenses morpheme-internal empty nuclei or not.

Thus a form such as *batt'ry* in London contains a fake cluster *tr* which is separated by an empty nucleus. In this context, *t* has no governing responsibilities, unlike in *ba[tr]y* where it governs an *r* in the same onset. Given the intervening empty nucleus in *batt'ry*, *t* occupies the prime lenition site in (6); hence the occurrence of glottalling in this form.

This situation is parallel to that found in forms containing *tl* or *tn*, which are also fake clusters. Neither *tl* nor *tn* is a possible onset (see KLV 1990). Nor is either a possible trans-syllabic sequence, for the same reason as that which holds for *tr*, namely that the resonant lacks the requisite charm and complexity properties that would enable it to govern *t*. Both *tl* and *tn* must therefore contain an intervening empty nucleus. The prediction is that any system showing lenition before an empty nucleus (see (15b)) will also show it in forms containing *tl* or *tn*. And this is indeed what we do find:

(30) NYC ɾ Lon ʔ
* √ atlas, cutlass, chutney

7 SUMMARY

We have presented an analysis of English *t*-lenition which dispenses with ambisyllabicity, resyllabification and extrinsic rule ordering. The lenition process itself is expressed directly as elements loss, specifically the coronal element in the case of glottalling and the occlusion element in the case of tapping. The unification of the contexts in which the process occurs is achieved by identifying the notion **prime lenition site** with a structural configuration in which a licensed nucleus displays a diminished capacity to license segmental material in a preceding onset. Finally, we interpret the notion of **protected environment** in terms of the governing responsibilities that an onset occupying an otherwise lenition-favouring context discharges in relation to adjacent positions.

APPENDIX: THE *-EE/-OO* CASES

It remains for us to comment on a sub-class of words which pose potential difficulties for any analysis of *t*-lenition in English. As far as we know, Leslie (1983) was the first to draw attention to the apparently anomalous behaviour of what he refers to as the *'13-14'* set of items, including the following:

(31) a. thirteen, fourteen, eighteen, nineteen, canteen, frontier, settee
b. pontoon, cartoon, tattoo, spittoon
c. seventeen, guarantee

These forms unexpectedly show lenition in a potentially uphill stress configuration, specifically one in which a dominant foot is preceded by a recessive foot which may be either degenerate (as in (31a, b), *thirtéen*, etc.) or branching (as in (31c), *seventéen*, etc.). The items in question have two further characteristics in common. Firstly, the final stressed nucleus is in all cases high and long (front, as in (31a, c), or back, as in (31b)). Secondly, they are all subject to the English Rhythm Rule (Prince 1983); compare iambic *thirtéen* with trochaic *thírtèen mén*. Glottalling of *t* in these items is normal in London vernacular. Tapped reflexes are apparently not as well established in New York City, although we have observed them to be quite common in other tapping dialects, including some types of Australian English. Both processes

appear to operate regardless of whether a particular form has been subject to iambic reversal. Thus both *thír[ʔ]èen* and *thìr[ʔ]éen*, for example, are grammatical.

Lenition in the trochaic alternants of the 13-14 items can plausibly be accounted for in the same way as in the major-minor stressed forms discussed in 6.2. That is, the stress configuration of *thírtèen* is the same as that of *látèx*; so if a system permits lenition within a prosodic domain defined at the word-level nuclear projection, these two forms should behave identically.

The iambic forms of the 13-14 words are potentially problematical for the reason that items such as the following with fixed or relatively stable uphill stress patterns never show lenition:

(32) NYC ɾ Lon ʔ

* * Titanic, itinerary, vitality

At present, in the absence of any complete story for the iambic 13-14 forms, we can do no more than suggest leads which may prove worth following up. One aspect of the data which we can be confident about has to do with the notable absence of the items *fifteen* and *sixteen* from the 13-14 set. In spite of having the same stress characteristics and the same vowel quality in the secondary-stressed nucleus as the words in (31a), these two items never display either glottalling or tapping. This result is exactly as the account outlined in 6.3.1 would predict. These words are the only *-teen* numerals in which the *t* governs a preceding position. The necessity of maintaining the interconstituent complexity slope thus prevents *t* from reducing in this context.

One plausible historical explanation for the anomalous behaviour of the 13-14 words is that the lenited reflex of *t* has been extended by analogical levelling from the trochaic alternants (where lenition is regular) to the iambic alternants. Whether the resulting synchronic pattern is amenable to phonological analysis or has been morphologised is an open question.

If there is a phonological basis to the distribution, it must depend partly on the lexical stress assigned to the 13-14 items. It is usually assumed without argument that the underlying stress pattern of these words corresponds to the form they take in citation or in phrase-final position, i.e. it is iambic. If this is correct, then reduction, as formulated here, will only affect derived 13-14 forms once they have undergone the Rhythm Rule. In order to get reduction to apply to unreversed forms, some supplementary process is required which makes reference to the long high identity of the following nucleus. On the face of it, the latter process looks entirely arbitrary (unless perhaps some interaction can be identified which involves branching nuclear structure and the simplex element structure of *i* and *u*).

If we abandon the assumption that the citation form of 13-14 words necessarily correponds to their lexical stress pattern, there are two alternatives open to us. One is to assume that neither foot in such words is marked as lexically prominent; each constitutes a potential landing site for sentence accent, with the observed configurations being determined by phrase-level rhythmic factors (see, for example, Bolinger 1986:60, Gussenhoven 1987). This approach is difficult to square with a Government-based analysis of reduction. In these bipedal forms, lack of lexical prosodic prominence implies absence of a governing domain at the word-level nuclear projection, which in turn means an absence of the conditions which trigger reduction. These conditions only become available at phrase level, and even then only when prominence is assigned to the first foot. Once again, some kind of supplementary process has to be invoked to effect reduction in the iambic alternants.

The other alternative is to take the trochaic configuration as basic and devise an 'Anti-Rhythm Rule' which reverses this pattern when no word-initial accent follows. The conditions for reduction are thus satisfied on the inner cycle. Under the Strict Cycle Condition, the reduction effects will not be undone if the trochaic pattern is reversed on any subsequent cycle. This account is illustrated in the following derivations:

(33)

Non-phrase-final	**Phrase-final**
Initial representation	
[[thírtèen] [mén]]	[... [thírtèen]]
Reduction	
[[thírʔèen] [mén]]	[... [thírʔèen]]
[thírʔèen mén]	[... thírʔèen]
Trochaic Reversal	
–	[... thìrʔéen]

On the face of it, this seems to be the simplest phonological solution, although the details of the Anti-Rhythm Rule obviously have to be worked out.

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