

## English Phonology and Morphology

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### Abstract

We illustrate the complexity and interest of English phonology and morphology through two case studies: the phonological and morphological behavior of sibilant suffixes, and the aspiration of voiceless obstruents. We focus on documenting individual variation in these areas and examining theoretical proposals that have been advanced to account for the attested range of variation that is found, highlighting cases where the data connect to larger issues in phonological and morphological theory.

*keywords: phonology, morphology, English, plural, possessive, aspiration, variation, African American English*

### 1 Introduction

When it comes to rich phonological and morphological systems, English is probably not the first language that springs to mind. In the realm of phonology, English might seem relatively unremarkable, lacking features such as phonemic tone, clicks, and vowel harmony. In terms of morphology, English has a developed derivational system, but only a handful of inflectional suffixes. However, a careful look at the data reveals interesting patterns and restrictions which are often glossed over in introductory textbook treatments, and sometimes even in the linguistics literature. In this chapter we illustrate the complexity and interest of English phonology and morphology through the lens of two case studies: aspiration of voiceless obstruents, and the so-called sibilant suffixes. These are the morphemes—plural, possessive, and others—which show surface alternations between [s], [z] and [ɪz].<sup>1</sup> Our focus will be on documenting individual

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<sup>1</sup> Our transcriptions throughout this article generally assume a variety of American English with features such as rhoticity and the COT-CAUGHT merger.

variation in these areas, of which there is much more than usually assumed. We also examine various theoretical proposals, new and old, to account for the range of variation that is found, and highlight cases where the data connect to larger theoretical discussions about phonology and morphology.

The analyses provided in this chapter could be formulated in virtually any phonological and morphological theories. Largely for expository convenience, we rely on theoretical descriptions which we hope are intuitive for the majority of readers, and which require little additional explanation. Thus, our phonological analyses rely on abstract underlying representations which are converted into more concrete surface representations using simple rewrite rules of the form  $A \rightarrow B / C\_D$  (“A goes to B in the environment between C and D”). In the realm of morphology, we use the notational conventions of Distributed Morphology (Halle and Marantz 1993). If the phonological, underlying form of an affix denoting plurality is /z/, we write this as follows:

PLURAL       $\leftrightarrow$       /z/

Our focus on individual variation in the domains of phonology and morphology naturally means that certain aspects of the data are left out of the discussion in this chapter. For example, we do not discuss intraspeaker variation, and do not provide much discussion of fine phonetic detail (but see sections 10 and 13 on aspiration). We refer interested readers to work such as Theodore et al. (2011), Mealings et al. (2013), and Plag et al. (2017) for sibilant suffixes, and Klatt (1975), Cooper (1991), and Iverson and Salmons (1995) for aspiration.

## 2 Sibilant suffixes

English is often cited for its impoverished inflectional system, as in the following description which attributes to the language only eight inflectional suffixes:

“English has a relatively small set of inflectional suffixes, consisting of plural -s, (e.g. girls, houses), possessive -s (e.g. John’s hat, the girl’s hat), third-person present tense -s (e.g. She runs), past tense -ed (e.g. John guessed), participle -ed (e.g. He has helped), progressive -ing (e.g. He is running), and the comparative and superlative endings -er

and -est (e.g. smaller, smallest).” (Wolfram and Schilling 2016: 79)

Both phonologically and orthographically however, there are only five different forms here:

|                  |  |
|------------------|--|
| [s] ~ [z] ~ [ɪz] | plural, possessive, third-person present tense |
| [t] ~ [d] ~ [ɪd] | past tense, participle                         |
| [ɪŋ] ([ɪn])      | progressive                                    |
| [ə]              | comparative                                    |
| [ɪst]            | superlative                                    |

We focus here on the “sibilant suffixes” (adopting the terminology of Wójcicki 1995), which always contain a sibilant but vary in the voicing of this sibilant, and in the presence or absence of a preceding reduced vowel.<sup>2</sup> The distribution of the three variants of the sibilant suffixes is as follows in standard English (Swadesh and Vogelin 1939, Francis 1958, and many others):

|      |  |
|------|--|
| [ɪz] | after sibilants (s, z, ʃ, ʒ, tʃ, dʒ)             |
| [s]  | after voiceless non-sibilants (p, t, k, f, θ)    |
| [z]  | after all other consonants, and after all vowels |

This same distribution applies to the plural (*shops, hands, bridges*), possessive (*shop’s, hand’s, bridge’s*) and present tense suffixes (*shops, hands, bridges*). However, a number of complications in different varieties of English change this picture. Below we discuss a number of constraints applying to various instantiations of the sibilant suffixes in different varieties of English, including: a fourth allomorph [ɪs], the sibilant suffix after s + voiceless stop stems (sT), the cooccurrence of possessive and plural markers, and the existence of double plurals. We begin, however, with some discussion of the standard system sketched above, and how it should be analysed.

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<sup>2</sup> We transcribe this vowel as [ɪ] throughout the chapter, and analyze it as a reduced version of /ɪ/ for varieties which distinguish between *roses* with [ɪ] and *Rosa’s* with [ə] (Flemming and Johnson 2007).

### 3 The underlying form of the sibilant suffixes

A number of proposals have been defended in the literature regarding the underlying representation (UR) of the sibilant suffixes. The most common of these assumes underlying /z/, and the traditional argument in favor of the voiced but vowelless UR is that it is the only choice which is consistent with the rest of English phonology (analyses with /z/ include Wells 1949, Langacker 1967, Dale 1972, and Kuiper and Allan 2004: 181). Consider the following derivations of *cups*, *cubs*, and *buses* assuming /z/ as the plural marker:

|                     |  |                      |                      |         |
|---------------------|--|----------------------|----------------------|---------|
| UR                  |  | /kʌp-z/              | /kʌb-z/              | /bʌs-z/ |
| <b>Epenthesis</b>   | ∅ → ɪ / [ + strident] _ [ + strident] # <sup>3</sup> | -----                | -----                | bʌsɪz   |
| <b>Assimilation</b> | [ + voice] → [-voice] / [-voice] _ #                 | kʌps                 | -----                | -----   |
| <b>Other rules</b>  |  | k <sup>h</sup> ʌps   | k <sup>h</sup> ʌbz   | bʌsɪz   |
| SR                  |  | [k <sup>h</sup> ʌps] | [k <sup>h</sup> ʌbz] | [bʌsɪz] |

These derivations produce the correct results by virtue of the bleeding interaction between epenthesis and assimilation. Reversing the rules would yield the incorrect /bʌs-z/ → bʌss → \*[bʌsɪs] (but see the next section). Assuming underlying /s/ instead of /z/ would require a rule turning /s/ to [z] in /fʌl-s/ → [fʌlz] ‘falls.’ However, words such as /fʌls/ → [fʌls] ‘false’ show that this rule would require morphological conditioning. /z/ should therefore be favored if we follow the often-implicit assumption made explicit by Zwicky (1975: 138): “Basic forms should be chosen so as to minimize morphological conditioning of allomorphs.” Perhaps because of the prevalence of this assumption, very few people have defended underlying /s/ in print. Kiparsky (1982) and Honda and O’Neil (2017) are exceptions, but these authors do not provide full-fledged analyses, and do not discuss minimal pairs of the *falls-false* type. Sloat and Hoard (1971) partly opt for the /s/ solution, retaining /z/ only for the plural suffix and using /s/ for all other sibilant suffixes because /s/ is crosslinguistically unmarked. /z/ for the plural

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<sup>3</sup> In the feature system we assume, [ + strident] segments are all and only segments with a sibilant portion (as in Kosa 2010; see La Charité 1993 for explicit arguments in favor of this interpretation). Unlike for Halle (1961) and Reiss (2018), for example, dental and labiodental fricatives are [-strident] here.

is justified as a departure from the markedness criterion by virtue of voicing alternations such as *knife* ~ *knives*, which are absent with the other sibilant suffixes (e.g. *knife* ~ *knife's*).

The situation for underlying /ɪz/ or /əz/ (/Vz/) is slightly different. Hockett (1958: 282, cited in Zwicky 1974: 208) argues that such underlying forms run into problems when we consider the contrast between [bouz] 'bows' and [bouəz] 'boas.' Why does the vowel of the plural delete in one, but not the other? However, this question can be answered even without invoking morphological differences between the forms. If the plural is /ɪz/, we have /bou-ɪz/ 'bows' vs. /bouə-ɪz/ 'boas,' and we can say that [ɪ] deletes in this context, while [ə] does not. Clearly /ɪ/ survives in unstressed position in words like *infinity*, but by restricting the deletion rule to word-final position before [z], this problem is avoided. Even if we take the plural to be /əz/, as it would be for speakers with the same vowel in *roses* and *Rosa's*, *bows* and *boas* are still distinct, as /bou-əz/ vs. /bouə-əz/. With a rule that deletes exactly one schwa, we would derive the correct surface forms [bouz] 'bows' and [bouəz] 'boas.'

In light of the paragraphs above, it is perhaps not surprising to note that analyses with /Vz/ are more common than analyses with /s/. URs with vowels have been defended by Bloomfield (1933: 212) and Nida (1948), by parallelism with the reduced forms of *is* and *has*. These words clearly do have underlying vowels, and yet they can be reduced to a non-syllabic form which shows the same [s] ~ [z] variation as the other sibilant suffixes. This apparent parallelism is criticized extensively by Zwicky (1975), who points out that the various syntactic restrictions on reducing *is* and *has* to 's have no parallel among the other sibilant suffixes.

#### 4 Counterbleeding

For some speakers the sibilant suffixes actually have four allomorphs, adding [is] to the three standard forms. The distribution of allomorphs in these varieties is as follows:

- [is] after voiceless sibilants (s, ʃ, tʃ)
- [iz] after voiced sibilants (z, ʒ, dʒ)
- [s] after voiceless non-sibilants (p, t, k, f, θ)
- [z] after all other consonants, and after all vowels

By reordering the assimilation and epenthesis rules with respect to the standard English system, we derive the desired results. This case is thus parallel to Canadian Raising and its interaction with Flapping, where two different but closely-related varieties differ in their rule ordering (Joos 1942).

|   |         |         |         |
|---|---------|---------|---------|
| UR  | /kʌp-z/ | /kʌb-z/ | /bʌs-z/ |
| <b>Assimilation</b> [ + voice] → [-voice] / [-voice] _ #  | kʌps    | -----   | bʌss    |
| <b>Epenthesis</b> Ø → ɪ / [ + strident] _ [ + strident] # | -----   | -----   | bʌsɪs   |
| Other rules   | kʰʌps   | kʰʌbz   | bʌsɪs   |
| SR  | [kʰʌps] | [kʰʌbz] | [bʌsɪs] |

Baković (2007: 247) claims that such a counterbleeding system “would be impossible to replicate” in his theory, and argues that it is unattested. However, he refers to Basbøll (1972: 40-41) who claims that this is in fact attested for some speakers of American English. This claim was subsequently reported independently by Anderson (1973: 41), although he claims that the [ɪs] ~ [ɪz] distinction is only really present at an intermediate level, since he believes that American English has “neutralization of obstruent voicing distinctions finally after reduced vowels” (Anderson 1973: 51). Although optional and whole or partial devoicing of final voiced fricatives in English is a fact (see for example Gonet and Swiecinski 2012, Cruttenden 2014: 193), we disagree with Anderson that this results in complete neutralization. We think that for most speakers, for example, *nutritiou[s]* and *Trisha’[z]* do not rhyme.

## 5 sT stems

For a number of sibilant suffixes there is variation across speakers in what happens to stems ending in s + voiceless stop (we symbolize all voiceless stops with T). The standard English system has [sTs] in these words, but as we will see, various forms of deletion, epenthesis, metathesis, and zero marking are also attested. This section describes the range of variation we find with sT stems and provides rule-based analyses of each system.

For some speakers, sT-final stems trigger epenthesis just like sibilant-final stems do. Thus, writing about the south and southwest Midlands region in England, Wright

(1905: 261) mentions forms such as [bi:stiz] ‘beasts’ and [p<sup>h</sup>əʊstiz] ‘posts,’ noting that such forms are confined to stems ending in /st/ rather than /sp/ or /sk/. Similar forms are also noted by Jespersen (1948: 189), as Fruehwald and Gorman (2011) discuss. The plural is not the only sibilant suffix to trigger epenthesis: in African American English (AAE) some allow [k<sup>h</sup>ənsistiz] ‘consists’ and [dʌstiz] ‘dusts’ (Fruehwald and Gorman 2011: 42). Jespersen cites examples from all over southern England, from Somerset to London.

In the United States, it seems that /sp/ and /sk/-final nouns can also trigger epenthesis in the relevant varieties. Miller (1999) and references therein document this pattern in white Appalachian speech (Labov 1972: 22-23) and, less commonly, in AAE (Fasold and Wolfram 1970). Examples include [dɛskiz] ‘desks’ and [waspiz] ‘wasps.’ For speakers with forms like these, the epenthesis rule must be rewritten as  $\emptyset \rightarrow \text{ɪ} / [+strident] (t) \_ [+strident]\#$  or  $\emptyset \rightarrow \text{ɪ} / [+strident]([-continuant, -voice]) \_ [+strident]\#$  depending on whether /t/ is the only trigger.

sT stems sometimes also trigger epenthesis because of stop deletion, giving forms such as [wasiz] ‘wasps,’ [gousiz] ‘ghosts,’ and [dɛsiz] ‘desks,’ which occur in AAE (Fasold and Wolfram 1970, Burling 1971, Labov 1972, Miller 1999). The authors writing about such forms often do not give the corresponding singulars for their speakers, which is of great relevance for interpreting the data correctly. If speakers have [dɛs] ~ [dɛsiz] ‘desk’ ~ ‘desks,’ there is no argument for underlying /k/ at all (final cluster reduction is “very frequent” in AAE; Bailey and Thomas 1998: 80), and we would set up /dɛs/, retaining the same set of rules as for standard English. Only in the case of [dɛsk] ~ [dɛsiz] do we have to modify the rules, perhaps including a rule of the sort  $C \rightarrow \emptyset / [+strident] \_ [+strident]$ . However, we have not been able to verify that speakers with this system exist.

A further variation on the sT system is to delete the voiceless stop without epenthesizing, giving forms like [dɛs:] ‘desks’ and [gous:] ‘ghosts’ (Labov et al. 1968: 331, Fasold and Wolfram 1970: 45, Dillard 1972, Wolfram and Christian 1976: 39; see discussion in Miller 1999: 273). The rule immediately above,  $C \rightarrow \emptyset / [+strident] \_ [+strident]$ , applies in these varieties, and is ordered between Epenthesis and Voicing Assimilation:

|                     |  |         |          |
|---------------------|--|---------|----------|
| UR                  |  | /mɛs-z/ | /dɛsk-z/ |
| <b>Epenthesis</b>   | $\emptyset \rightarrow \text{ɪ} / [+ \text{strident}] \_ [+ \text{strident}] \#$ | mɛsɪz   | -----    |
| <b>Deletion</b>     | $C \rightarrow \emptyset / [+ \text{strident}] \_ [+ \text{strident}] \#$        | -----   | dɛsz     |
| <b>Assimilation</b> | $[+ \text{voice}] \rightarrow [- \text{voice}] / [- \text{voice}] \_ \#$         | -----   | dɛss     |
| Other rules         |  | mɛsɪz   | dɛs:     |
| SR                  |  | [mɛsɪz] | [dɛs:]   |

Deletion counterfeeds Epenthesis, since derived dɛsz is subject to Epenthesis, like underlying /mɛs-z/. Like the counterbleeding system with both [ɪs] and [ɪz], this represents another case of opacity in the phonological derivation of the sibilant suffixes.

Metathesis is also attested, so that the plural of [dɛsk] ‘desk’ is [dɛs:k] ‘desks,’ for example (Allen 1973-1976, Wolfram and Christian 1976: 39). For these speakers we would have the following derivations, where epenthesis must precede assimilation, and metathesis must follow epenthesis.

|                     |   |         |          |
|---------------------|---|---------|----------|
| UR                  |   | /mɛs-z/ | /dɛsk-z/ |
| <b>Epenthesis</b>   | $\emptyset \rightarrow \text{ɪ} / [+ \text{strident}] \_ [+ \text{strident}] \#$                          | mɛsɪz   | -----    |
| <b>Metathesis</b>   | $[- \text{voi}, - \text{cont}] s \rightarrow s [- \text{voi}, - \text{cont}] / [+ \text{strident}] \_ \#$ | -----   | dɛszk    |
| <b>Assimilation</b> | $[+ \text{voice}] \rightarrow [- \text{voice}] / [- \text{voice}] \_ \#$                                  | -----   | dɛssk    |
| Other rules         |   | mɛsɪz   | dɛs:k    |
| SR                  |   | [mɛsɪz] | [dɛs:k]  |

The variation described above appears to be phonological, in the sense of involving regular alternations in phonologically-specified contexts. However, in some cases, there is also the possibility of a morphological analysis, as with people who have no singular-plural distinction for sT stems: [dɛsk] ‘desk(s).’ Miller (1999) and the sources cited there report that this was common in Middle English, at least for /st/-final stems, although a wider distribution including /sp/ and /sk/ is found for some American English speakers today. This could in principle be analysed as a null spellout of the plural morpheme in the environment of sT-final stems, or else as a phonological rule of the type  $[+ \text{strident}] \rightarrow \emptyset / [+ \text{strident}] [- \text{voi}, - \text{cont}] \_$ . If this pattern were general across all sibilant suffixes, and not just the plural, this would be a reason to favor the phonological treatment. Unfortunately, this question does not appear to have been systematically investigated for



the relevant speakers, leaving both analytical options as possibilities.

Moving beyond the more common sibilant suffixes, there is another case of a sibilant suffix surfacing as Ø. This is the situation reported by Spradlin (2016) for the hypocoristic sibilant suffix found in truncated forms such as [aks] *awks* ‘awkward’ and [t<sup>h</sup>outs] *totes* ‘totally.’ She finds 17 sT-final truncations in her data, but none of these ever surface with the hypocoristic suffix: [mædʒɛst(\*s)] *majest*(\*s) ‘majestic’ (for similar restrictions in nicknames of hockey players, see Kennedy and Zamuner 2006). According to Spradlin, this is part of a general “restriction against two sibilants co-occurring in the coda of any one truncation” (2016: 281), but we believe this is too broad given the occurrence of forms like [k<sup>h</sup>wɛstʃ] for ‘question’ in the data. It does appear to be the case, however, that both sibilant- and sT-final stems disallow the addition of the hypocoristic sibilant suffix. This can be handled morphologically with spellout rules of the following type:

|              |   |     |                         |
|--------------|---|-----|-------------------------|
| HYPOCORISTIC | ↔ | Ø   | / V(C)[ +strident](C) _ |
| HYPOCORISTIC | ↔ | /z/ |                         |

If the last vowel is followed by a sibilant, with or without additional consonants, the suffix does not surface. In all other contexts, however, the form is /z/, and behaves like the other sibilant suffixes in undergoing voicing assimilation in the relevant environments.

In conclusion, our survey of sT stems has uncovered a number of different ways in which sT sibilant suffixes undergo different rules than in Standard English. The variation we find is interesting in its own right, but also relates to broader theoretical topics. For example, we have seen that some speakers have an opaque counterbleeding interaction between epenthesis and assimilation rules, where the standard system has transparent bleeding. We have also seen variation in whether phonology or morphology is the best tool for modeling the variation we find, especially in the domain of sT restrictions on hypocoristics.

## 6 Double plurals

In some varieties of English, double plurals are found next to forms where the plural is

singly marked. Wright (1905) discusses forms of this type, as does Jespersen (1948). For the speakers analyzed in these sources, who are found in the Midlands and southern England, double plurals are frequent in the environments where they can appear, but phonologically-restricted to occur with sT stems. In addition to [bi:stɪz] ‘beasts’ and [pʰoustɪz] ‘posts’ (for the epenthesis after sT see the previous section), we also find [bi:stɪzɪz] and [pʰoustɪzɪz] (Wright 1905: 261).

Double plurals can also be found in AAE even for non-sT stems, and Harrison (1884: 245) mentions not only examples like *beastesses* ‘beasts’ but also *umbrellases* ‘umbrellas’ and *fokeses* ‘folks.’ Since these forms are given by Harrison in orthography, it is difficult to know what the pronunciations were, but judging by the <ss> in *beastesses*, a voiceless [s] realization of the first plural marker must have been possible, i.e. [bɪstɪsɪz]. The pronunciation [bræstɪsɪz] ‘breasts’ is used by Jay Z in the Beyoncé song Drunk in Love, confirming that even today such pronunciations are possible for some speakers. Double plurals outside of sT stems are also found in Hiberno-English, in forms such as *bellowses* ‘bellows’ and *pantses* ‘pants’ (Walshe 2009: 76, citing Taniguchi 1972 and Dolan 2006). Dolan’s (2006: 102) transcription of *galluses* ‘braces’ (from an obsolete form of *gallows*) is /gæləsəs/, with two voiceless sibilants. We suspect that the final /s/ is a mistake, given other plurals like /brʌðərz/ ‘brothers’ (Dolan 2006: 50), and the explicit statement that double plurals add /əz/ (Dolan 2006: xxvii). However, it seems likely that Hiberno-English allows [gælɪsɪz] following the AAE pattern, a form which is also mentioned by Wright (1905: 264) for northern England.

For speakers who have a [z] in both plural markers, we can simply admit two spellout rules of the plural, with speakers being free to choose which to use:

|    |   |      |
|----|---|------|
| PL | ↔ | /z/  |
| PL | ↔ | /zz/ |

The application of the Epenthesis rule can either be simultaneous or iterative. The direction of the iterative process is unimportant, although we show left-to-right application here:

|  | Simultaneous | Iterative L→R                  |
|--|--------------|--------------------------------|
| UR   | /bistzz/     | /bistzz/                       |
| <b>Epenthesis</b> $\emptyset \rightarrow \text{ɪ} / [+ \text{strid}]([- \text{cont}, - \text{voi}])_0 [+ \text{strid}]_0 \#$ | bistɪzɪz     | bistɪzz $\rightarrow$ bistɪzɪz |
| <b>Assimilation</b> $[+ \text{voi}] \rightarrow [- \text{voi}] / [- \text{voi}] \_ \#$                                       | -----        | -----                          |
| Other  | bistɪzɪz     | bistɪzɪz                       |
| SR   | [bistɪzɪz]   | [bistɪzɪz]                     |

With speakers for whom only one plural marker surfaces with a voiced sibilant, we believe that the best analysis is underlying /s/. A morphologically-conditioned rule voices a word-final plural marker after voiced segments, but since only one of the markers is word-final, only one is voiced. If the other sibilant suffixes behave similarly with respect to double marking, we could state the rule instead over all (voiceless) suffixes. In the absence of such data, we restrict ourselves to the plural here. Sample derivations in Jay Z's idiolect would then run as follows:

|  |        |         |             |
|--|--------|---------|-------------|
| UR   | /fals/ | /fal-s/ | /bɪɛst-s-s/ |
| <b>Epenthesis</b> $\emptyset \rightarrow \text{ɪ} / [+ \text{strid}]([- \text{cont}, - \text{voi}])_0 [+ \text{strid}]_0 \#$ | -----  | -----   | bɪɛstɪsɪs   |
| <b>Assimilation</b> $\text{PL } s \rightarrow [+ \text{voi}] / [+ \text{voi}] \_ \#$   | -----  | falz    | bɪɛstɪsɪz   |
| Other  | -----  | -----   | bɪɛstɪsɪz   |
| SR   | [fals] | [falz]  | [bɪɛstɪsɪz] |

This analysis is usually deemed implausible for the reasons discussed in the section on underlying forms: why propose a morphologically-conditioned rule when regular phonology works? However, for some speakers of AAE and Hiberno-English, there is evidence from double plurals for an analysis of exactly this sort. This illustrates how speakers faced with very similar data can come to assume different analyses, here reflected in a different division of labor between phonology and morphology.

## 7 Possessive and plural co-occurrence

In standard English the possessive and the plural suffix do not appear alongside each other:

|                   |       |                   |
|-------------------|-------|-------------------|
| Basic form        | dog   | [dag]             |
| Plural            | dogs  | [dagz]            |
| Possessive        | dog's | [dagz]            |
| Possessive plural | dogs' | [dagz], *[dagziz] |

Stipulating that the possessive and plural suffixes do not co-occur is one thing, but which suffix is the /z/ representing? Zwicky states that “S representing the Gen[itive] doesn’t occur along with S representing the Pl[ural]” (Zwicky 1975: 133), while Kruisinga (1932) takes the sibilant suffix at the end of *dogs'* to be the possessive marker, with the plural marker being dropped. Kruisinga’s analysis relies on generalizing from other cases where the attributive noun expresses a plural idea but is not marked with a plural suffix, such as *a peasant family* ‘a family of peasants.’ However, there is evidence from nouns with irregular plurals which favors Zwicky’s analysis:

|                   |                   |                   |
|-------------------|-------------------|-------------------|
| Plural            | knives            | crises            |
| Possessive        | knife's           | crisis's          |
| Possessive plural | knives', *knifes' | crises', *crisis' |

Possessive plurals take the same irregular form as the plural, rather than the regular form of the possessive, suggesting that the sibilant suffix in these cases is the plural.

It is important to note that irregular plurals that do not end in /z/ add the sibilant suffix to their irregular plural form, as in *children's*, *women's*, and indeed *mice's* and *geese's* (Payne 2009: 326, citing Zwicky 1987). This shows that there is no morphological restriction against forms which mark both plurality and possessiveness. Avoidance of possessive plurals thus seems to be at least partly phonologically-motivated.

This issue also crops up when the possessive clitic is attached to something other than the head of a plural noun phrase:

|          | Non-possessive                                | Possessive  |
|----------|---|---|
| Singular | parent-in-law<br>the student in the lecture   | parent-in-law's<br>the student in the lecture's     |
| Plural   | parents-in-law<br>the students in the lecture | %parents-in-law's<br>%the students in the lecture's |

Kruisinga (1932) states that “the plurals fathers, fathers-in-law, and such groups as the queens of England never take a possessive suffix, although the groups father-in-law or queen of England do” (Kruisinga 1932: 39). This claim – which we refer to as “Kruisinga’s Generalization” and which is echoed by Carstairs-McCarthy (1987), Zwicky (1988), Picard (1990), and Payne (2009) – is not true for all speakers, however. We conducted an informal survey to investigate the acceptability of *queens of England’s* as a possessive modifier (N = 26). Our respondents were split exactly in half, with 13 following Kruisinga’s Generalization, and the other 13 finding *queens of England’s* acceptable. There is variation already noted in the literature about whether irregular plurals such as *men* and *sheep* are also subject to this restriction. Many speakers obey Kruisinga’s Generalization only with regular plurals, while some have a stricter interpretation which rules out even the irregular examples (Carstairs-McCarthy 1987, Zwicky 1988, Picard 1990, Payne 2009).

We can add to the typology of possessive-plural interactions by considering speakers who have no restrictions on co-occurrence whatsoever. In the relevant varieties, we can thus have phrases like *the farmerses cows* (Wright 1905: 265). Perhaps surprisingly, Wright claims that this is “a general tendency in all dialects of Sc[otland] Irel[and] and Eng[land]” (Wright 1905: 265). We thus seem to have at least the following systems for different speakers of English (gray cells and \* indicate ungrammaticality, white cells and ✓ grammaticality):

|                                   | Zwicky<br>(1988) | Carstairs-<br>McCarthy (1987) | Our<br>survey | Wright<br>(1905) |
|-----------------------------------|------------------|-------------------------------|---------------|------------------|
| the sheep in the pen's food       | *                | ✓                             | ✓             | ✓                |
| the queens of England's victories | *                | *                             | ✓             | ✓                |
| the farmerses cows                | *                | *                             | *             | ✓                |

In this table we can see that although the system we report in this chapter had not previously been identified in the literature, it nicely completes the typology in filling in a gap between maximally-unrestrictive and maximally-restrictive systems.

## 8 Conclusion on sibilant suffixes

In the preceding sections, we took a careful look at interspeaker variation in the English sibilant suffixes. The main fact to highlight is the amount of diversity found when speakers' individual systems are considered in detail. For example, even for something as well-studied as the English plural suffix, there are a number of non-standard systems that are not usually discussed in the literature. Many of these concern variation in the scope of epenthesis, but various processes of stop deletion and metathesis are also found. This variation in the data is reflected in the analyses that we have provided: speakers vary in the underlying forms, in the set of rules, in the ordering of those rules, and in the involvement of morphology. In summary, every core aspect of the analysis is subject to some form of variation. We have seen similar patterns for other sibilant suffixes, such as the hypocoristic suffix in truncated forms. No doubt there are many other systems which we have not discussed here. In our discussion of the co-occurrence of plurals and possessives, where the literature goes back to Kruisinga (1932), we have shown that some speakers have a previously-unidentified system. Our findings fit perfectly in the existing typology of plural-possessive co-occurrence, adding a cell whose existence we might predict based on previous work.

## 9 Aspiration

We now turn to the question of aspiration in English. We begin by surveying a number

of claims in the literature which go against the received wisdom on when, where, and to what, aspiration applies. A common generalization is that /p, t, k/ are aspirated word-initially and at the beginnings of stressed syllables, but remain unaspirated after /s/ (see Trubetzkoy 1958: 147, Kahn 1976, Kenstowicz 1994: 507 among others). We will show that /s/ is not the only fricative which can block aspiration on a following stop, that aspiration may occur in unstressed positions word-medially, and that the English aspiration system also targets affricates and fricatives. We then formulate a new analysis of the distribution of aspiration that we believe is preferable to earlier alternatives, which often fail to incorporate many of the facts we discuss here.

## **10 /sp, st, sk/ vs. /sb, sd, sg/**

All phonological analyses of aspiration that we are aware of treat initial [sp, st, sk] as underlying /sp, st, sk/, entailing that something must be said about the absence of aspiration in this environment. We review data which could be taken to argue for /sb, sd, sg/ as the underlying representations of these clusters, dispensing with any need to say something special about aspiration, since /b, d, g/ are not typically aspirated in English. However, we will ultimately defend the traditional analysis with /sp, st, sk/, on the basis of alternations between [p<sup>h</sup>] (after non-s) and [p] (after s).

We begin by noting that spellings from preliterate children seem to support [sp, st, sk] being analyzed as phonologically /sb, sd, sg/. There is much anecdotal evidence for spellings with <sb, sd, sg> for the relevant clusters, but formal studies of the phenomenon have also been carried out. For example, Hannam, Fraser, and Byrne (2007) tested the spelling preferences of newly literate children. Their “[r]esults confirm that children relate words with stops after /s/ to words with initial /b, d, g/ rather than to words with initial /p, t, k/” (Hannam et al. 2007: 399). There is some evidence, we think, that these spellings are not merely recording non-distinctive phonetic detail. Specifically, there seem to be children who spell unaspirated [p, t, k] as <b, d, g> *only* after /s/, while using <p, t, k> for [p, t, k] in other positions. This is seen in a small corpus of the child SP’s preschool spellings (Perez 2018):

|      |                          |                                     |
|------|--------------------------|-------------------------------------|
| SP   | Conventional orthography | Comment                             |
| SgR  | square                   | [sk] as <Sg>                        |
| Srko | circle                   | [k] as <k> when not preceded by /s/ |
| sDr  | star                     | [st] as <sD>                        |

While /sb, sd, sg/ may be the analysis used by some English-speaking children, we believe that most adult grammars nevertheless use /sp, st, sk/. This is evidenced by alternations where words beginning in [p<sup>h</sup>, t<sup>h</sup>, k<sup>h</sup>] can appear with [p, t, k] when a formative ending in [s] precedes, as we exemplify below. Data on how common these pronunciations are come from Zuraw and Peperkamp (2015). We will return to the question of morphological and/or syllabic conditioning in these cases in section 12 below.

| Base                   | [s]-form     | Proportion of speakers |
|------------------------|--------------|------------------------|
| [p <sup>h</sup> ]lease | %di[sp]lease | 50% (8/16)             |
| [t <sup>h</sup> ]rust  | %di[st]rust  | 50% (8/16)             |
| [k <sup>h</sup> ]over  | di[sk]over   | 100% (16/16)           |

There is significant interspeaker variation in which words show deaspiration after *dis-*. However, we believe that virtually all speakers show deaspiration in at least some words. As illustrated by *discover*, this can happen even in prefixed words which are formally (*dis-* + *cover*) and semantically transparent (for the semantics, cf. *uncover*). There is some evidence from less common alternations that this pattern is productive. The word *it's* can be pronounced [s] in colloquial registers, a possibility used frequently in the song *S'Wonderful*. In the rendition by Fred Astaire and Audrey Hepburn in the 1957 movie *Funny Face*, we hear forms such as [sp]aradise for 'it's paradise.'<sup>4</sup> And in supersymmetric particle physics, there is a prefix /s-/ used for the hypothesized supersymmetric counterparts of certain particles. We thus have forms such as [sk]uark (supersymmetric partner of a quark) and [st]op (supersymmetric partner of a top quark), homophonous

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<sup>4</sup> Some speakers would produce aspiration here, despite the preceding [s]. This is likely due to the prosodic boundary between the clitic and its host.

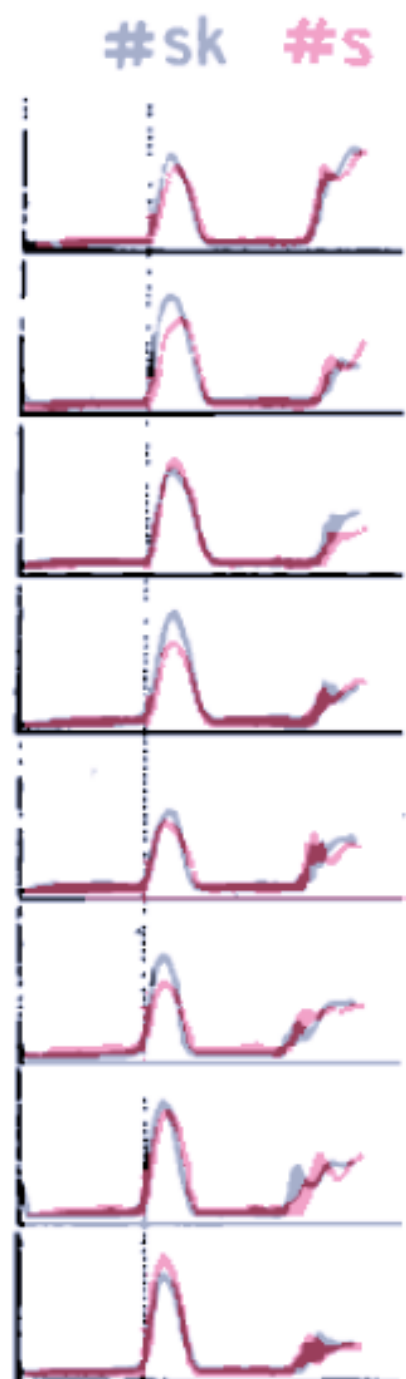


with monomorphemic *stop*.<sup>5</sup> Alternations such as these are telling: most speakers have never heard these words, so to the extent that there are clear intuitions about their pronunciation, these intuitions must represent an extension of already-existing phonological generalizations about aspiration.

Some have claimed that Yoshioka, Löfqvist, and Hirose's (1981) photoelectric glottography data support the view that the [+spread glottis] specification in /sT/ clusters is shared between the fricative and the stop. If there is phonetic evidence that these [p, t, k] stops have a phonological [+s.g.] specification, this would strongly argue against the interpretation where they are really voiced. The claim from Kingston (1990), based on Yoshioka et al.'s (1981) data, is as follows: the peak glottal width in single-fricative onset /s/ occurs relatively early, but shifts to occur later in /sT/ clusters. If [+s.g.] only attached to the /s/, it would be unexpected that the phonetic realization of aspiration shifts towards the stop. But if [+s.g.] is shared between the onset consonants, it makes sense that the phonetic realization should occur midway between the fricative and the stop. While Kingston (1990: 427) claims that this temporal compromise is exactly what happens, comparing glottal width data for /s/ and /sk/ onsets from Yoshioka et al. (1981) reveals that there is no shift in when the peak occurs:

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<sup>5</sup> Both of these words can be heard pronounced in this way in John Eckel's PhD defense: <https://www.youtube.com/watch?v=7vfTU9YjpW0>.



Glottal width (Y-axis)  
over time (X-axis)  
Dotted vertical line is  
offset of vowel voicing

**H** 200ms

Kingston's (1990) claim has been cited in other well-known work on aspiration, including Iverson and Salmons (1995), but based on the original data above, it is not clear to us that it is supported by phonetic evidence. Thus, while we agree that the stop in [sp, st, sk] is phonologically and phonetically voiceless, we do not believe that there is phonetic justification for treating it as phonologically aspirated, [+s.g.].

## 11 Is /s/ special?

Because of the traditional analysis of [sp, st, sk] clusters as /sp, st, sk/, it has been claimed that the position after /s/ is special for the purposes of aspiration in English (see references below). We argue that /s/ shows no special behavior when it comes to aspiration. Other fricatives, including /f/ and /ʃ/, pattern in exactly the same way. However, since /s/ is the only fricative allowed natively before word-initial voiceless stops, there are fewer contexts where absence of aspiration after other fricatives can be observed.

A number of authors have singled out the position after /s/ as showing special behavior when it comes to aspiration. Thus, Ewen and van der Hulst (2001: 126) say that “no aspiration takes place if the stop is preceded by /s/,” and Spencer (1996: 208) writes that “if the syllable or word begins with /s/ [...] the [aspiration] rule will not apply.” Kingston (1990: 428) predicts that loss of aspiration “may not be generalizable to other sequences of a continuant followed by a stop,” since “only sibilants and not all fricatives, much less all continuants, are frequently incorporated with following stops within single glottal gestures.” However, it is fairly easy to show that other fricatives can also block aspiration on following stops. For example, we have only unaspirated [p, t, k] in loanwords such as *spiel* /ʃpi:l/, *spritz* %/ʃpɹɪts/, *s(c)htick* /ʃtɪk/, *shtetl* /ʃtɛrəl/, *shtup* /ʃtʊp/, *Skoda* %/ʃkoudə/. Examples with initial /f/ followed by a voiceless stop are hard to come by, but we do have examples like [fɪfˈti:n], where [t] is possible for many speakers even when *-teen* is stressed (many speakers also allow [tʰ] here).

## 12 The role of the syllable and morpheme

Above we discussed the aspiration or lack thereof in morphologically-complex words

such as *dis-cover*. A common assumption about such words is that the aspiration status of the root-initial stop is predictable from morphological considerations, mediated by syllable structure. For example, in *dis[t]end*, *tend* is not a free morpheme with the relevant meaning. This means that there is resyllabification across the morpheme boundary, giving *di.stend*. Since the /t/ is now not in absolute syllable-initial position, there is no aspiration. Compare this to *dis[t<sup>h</sup>]aste*, which does include a free morpheme with the relevant meaning (*taste*). This stops resyllabification, so that we get *dis.taste*. The /t/ is now in absolute syllable-initial position, and therefore surfaces as aspirated. This line of reasoning can be found in several works about aspiration: the point about syllables is mentioned by Churma (1990: 50), Nusbaum and DeGroot (1990/1), and Wells (1990: 44), while the importance of morpheme boundaries is emphasized by Barna (1998: 5). The idea that aspiration is determined by syllabification, mediated by morphological factors, is present in Ogden et al. (2000).

While we acknowledge a strong tendency in this direction, we believe that there are cases which are not accounted for by this theory. Note first that there are cases where stops may be aspirated after fricatives even though there is no morpheme boundary involved, whether with a free or a bound morpheme. For example, most native speakers who are not themselves from Wisconsin have aspiration in *Wis[k<sup>h</sup>]onsin*, even though this name does not contain a free morpheme *consin*. Cases like this show that morphology is not sufficient for predicting post-fricative aspiration. This case may be salvaged by syllabification: *Wis.con.sin*. It should be mentioned that this approach requires lexically-stored syllabification, since other words with similar phonological shape do not show aspiration in this environment: *Mus[k]ogean*. However, even this is insufficient. In the section above, we noted the pronunciation [fɪf'ti:n], which would have to be syllabified *fi.fteen* in order to explain the [t]. Needless to say, this syllabification does not agree with native speaker intuitions. Even though we have *fif.teen*, [t] is still possible. This shows that aspiration blocking by fricatives is not limited by syllable boundaries.

### 13 Not just stops

Aspiration is traditionally taken to apply to voiceless stops, and is explicitly ruled out for affricates and fricatives by Cho's (1999) constraint \*[+s.g., +cont]. Acoustically, there is a longer VOT for all voiceless obstruents in aspirating positions, not just stops (Tatham

and Morton 1980). Kingston (1990: 408) says that “voiceless fricatives exhibit the widest glottal aperture of any voiceless consonant,” and Stevens (2000: 36-37) also discusses the open state of the glottis in the production of voiceless fricatives. The duration of glottal opening is “almost constant” across voiceless stops and voiceless fricatives (Tsuchida et al. 2000: 171). English /s/ and /t/ also show similar positional effects, including a higher centroid frequency in typical aspirating positions, such as at word beginnings and in stressed syllables (Phillips et al. 2018, citing Cho and Keating 2009). Thus, while traditional analyses ignore this, we think that it is clear that all voiceless obstruents are affected by the phonological statements determining aspiration. Consequently, the rules for aspiration that we propose will target [-voice] rather than [-voice, -cont].

#### 14 The role of paradigmatically-related forms

There is a debate in the literature concerning how to account for the dataset below:

|  |                                |
|--|--------------------------------|
| <i>mili</i> [t <sup>h</sup> ] <i>ary</i>     | <i>capi</i> [ɾ] <i>al</i>      |
| <i>mili</i> [t <sup>h</sup> ] <i>aristic</i> | <i>capi</i> [ɾ] <i>alistic</i> |

Despite the near-identical context in the second row, the underlying /t/s of these words surface with the same realization as in their base forms. Withgott (1982) argues that for *capitalistic*, we begin with (*capi*)*tal*, and once *-istic* is added, there is refooting to give (*capital*)(*istic*). For *militaristic*, however, we have (*mili*)(*tary*), with refooting giving (*mili*)*ta*(*ristic*). A separate adjunction rule applies to this form, providing the final representation (*mili*)(*ta*(*ristic*)). The /t/ in question is now foot-initial, which for Withgott (1982) means that it will be aspirated.

An alternative analysis is that of Steriade (2000), arguing that this is a paradigm uniformity effect. The /t/ in *militaristic* is not aspirated because of the environment it is in, but because the /t/ in the related form *military* is aspirated. Similarly, flapping in *capitalistic* is parasitic on flapping in *capital*. Steriade specifically suggests that uniformity makes reference to non-contrastive information, namely “duration of consonantal constrictions” (Steriade 2000: 314). 12 speakers of American English read a list of base nouns and adjectives, and their derived forms in *-istic*. With one exception, all forms from

all speakers showed correspondence between the base and the derived form (though see Riehl 2003, who replicated Steriade's experiment, and argued that the results do not support uniformity).

Davis (2004) argues instead that aspiration in *militaristic* is a regular phonological pattern, and cites words such as *Medi*[t<sup>h</sup>]*erranean*, *Lolla*[p<sup>h</sup>]*alooza*, *Nebu*[k<sup>h</sup>]*adnezzar*, and *abra*[k<sup>h</sup>]*adabra*. It should be mentioned here that Withgott (1982) eventually rejected the cyclic explanation above because of words like these. Steriade (2000: 324 fn. 4, 334) claimed that *Mediterranean* should instead be explained by influence from the orthographic geminate <rr> inducing a sort of illusory secondary stress. Davis' (2004) forms above show that a following orthographic geminate is not necessary. Something else is now needed to account for *capitalistic*. While Davis (2004: 108) claims to "argue for a different view than Steriade's," he still invokes paradigm uniformity for these flapping cases. However, the uniformity is at the level of foot structure, a phonological property, rather than Steriade's (2000) explicitly non-phonological constriction duration.

In this debate many different frameworks are used, and there are incompatible sets of assumptions about what phonology can(not) refer to. For example, Eddington (2006) claims that flapping and aspiration are exclusively determined through analogical relations rather than rules or constraints, the psychological reality of which he rejects. We believe that the right results can be obtained through relatively simple modifications of Withgott's (1982) original idea. Aspiration is indeed regular in words such as *Mediterranean*, by virtue of the foot-initial status of the third syllable (see Davis 2003 for a proposal deriving this foot structure, based on the so-called superfoot; cf. also Jensen 2000, Pater 2000, Davis and Cho 2003). Forms like *capitalistic* are derived cyclically as in Withgott (1982), where we first create (*capital*) and then use this to create (*capital*)(*istic*). The /t/ is in an unstressed, non-foot-initial syllable, and therefore does not aspirate. This proposal does not rely directly on a paradigmatic correspondence between properties of surface forms, nor does it incorporate non-phonological information into the analysis.

## 15 Aspiration in clusters

Virtually no sources on aspiration in English discuss what happens in words such as *opt*, *opts*, etc. We have no doubt that there is much interspeaker variation here, as well as

intraspeaker variation. However, our rules will assume what we believe to be a fairly common system for voiceless obstruents in clusters, based on the intuitions of the authors. We use T for any voiceless stop:

|   |  |
|---|--|
| opt / act / sect ...                    | $T^{\text{r}}T^{\text{r}} \sim T^{\text{h}}T^{\text{h}}$ |
| opts / acts / sects ...                 | $T^{\text{r}}T^{\text{r}}$                               |
| optics / actor / sector ...             | $T^{\text{r}}T$  |
| optician / nocturnal / sectarianism ... | $T^{\text{r}}T^{\text{h}} \sim T^{\text{h}}T^{\text{h}}$ |

We see here that there is generally aspiration in absolute word-final position (noted in the literature by Pulgram 1970: 53, Wells 1982: 46, Kreidler 1989: 117, Barna 1998: 9-10, Shattuck-Hufnagel 2000, among others), with unreleased allophones typically surfacing before other stops. Before aspirated stops, aspiration is possible but optional.

## 16 A new analysis of aspiration in English

In this section we attempt to formulate rules for the distribution of aspirated and unaspirated stops in English. We consider both the traditional analysis where stops are underlyingly unaspirated, as well as the alternative solution where English has /p<sup>h</sup>, t<sup>h</sup>, k<sup>h</sup>/ undergoing deaspiration in certain environments. While there are some problems for the traditional /p, t, k/ analysis, we believe that it is nevertheless preferable. If voiceless obstruents are underlyingly [-s.g.], the following rules will assign [+s.g.] in all and only the contexts where aspiration is possible:

- a. [-voi] → [+s.g.] / [<sub>F</sub> \_ ... ]
- b. [-voi] → [+s.g.] / \_ #                      optional
- c. [-voi] → [+s.g.] / \_ [+s.g.]              optional

This proposal assumes that all stressed syllables are foot-initial (see discussion in Kager 1995). Without this assumption, a rule could be added for aspiration in absolute syllable-

initial position. We also assume that the difference between *Muskogee* and *Wisconsin* is one of footing:  $(_{\text{F}} \text{mə})(_{\text{F}} \text{skougi})$  but  $(_{\text{F}} \text{wis})(_{\text{F}} \text{kansin})$ . We might wonder why, in the surface form  $[\text{ap}^{\text{h}}\text{t}^{\text{s}}]$  ‘opts,’ aspiration of the  $/\text{t}/$  is not possible by rule (c) above. We analyse the  $[\text{s}]$  of this word as  $[-\text{s.g.}]$ , a result that can be derived by applying devoicing of  $/\text{z}/$  to  $[\text{s}]$  late, after the rules for final aspiration and aspiration spreading. Below we illustrate some cases in which the aspiration rules do and do not apply, using as inputs the URs with footing and stress:

| Input   | $(_{\text{F}} \text{tap})$                  | $(_{\text{F}} \text{stap})$                  | $(_{\text{F}} \text{tə})(_{\text{F}} \text{ɛɪn})$    | $(_{\text{F}} \text{dɪ})(_{\text{F}} \text{tɛɪn})$    | $(_{\text{F}} \text{mə})(_{\text{F}} \text{skougi})$    |
|---------|---|--|--|---|---|
| a.      | $\text{t}^{\text{h}}\text{ap}$              | $\text{s}^{\text{h}}\text{tap}^{\text{h}}$   | $\text{t}^{\text{h}}\text{ə}^{\text{h}}\text{ɛɪn}$   | $\text{dɪ}^{\text{h}}\text{t}^{\text{h}}\text{ɛɪn}$   | $\text{mə}^{\text{h}}\text{s}^{\text{h}}\text{kougi}$   |
| b.      | $\text{t}^{\text{h}}\text{ap}^{\text{h}}$   | $\text{s}^{\text{h}}\text{tap}^{\text{h}}$   | -----  | -----   | -----   |
| c.      | -----                                       | -----  | -----  | -----   | -----   |
| SR      | $[\text{t}^{\text{h}}\text{ap}^{\text{h}}]$ | $[\text{s}^{\text{h}}\text{tap}^{\text{h}}]$ | $[\text{t}^{\text{h}}\text{ə}^{\text{h}}\text{ɛɪn}]$ | $[\text{dɪ}^{\text{h}}\text{t}^{\text{h}}\text{ɛɪn}]$ | $[\text{mə}^{\text{h}}\text{s}^{\text{h}}\text{kougi}]$ |
| Transl. | ‘top’                                       | ‘stop’                                       | ‘terrain’  | ‘detain’  | ‘Muskogee’  |

| Input   | $(_{\text{F}} \text{wis})(_{\text{F}} \text{kansin})$    | $(_{\text{F}} \text{apt})$                  | $(_{\text{F}} \text{itɪŋ})$                          | $(_{\text{F}} \text{sektə})$                |
|---------|--|---|--|---|
| a.      | $\text{wis}^{\text{h}}\text{k}^{\text{h}}\text{ansin}$   | -----                                       | -----  | $^{\text{h}}\text{s}^{\text{h}}\text{ektə}$ |
| b.      | -----  | $\text{ap}^{\text{h}}\text{t}^{\text{h}}$   | -----  | -----                                       |
| c.      | -----  | $\text{ap}^{\text{h}}\text{t}^{\text{h}}$   | -----  | -----                                       |
| SR      | $[\text{wis}^{\text{h}}\text{k}^{\text{h}}\text{ansin}]$ | $[\text{ap}^{\text{h}}\text{t}^{\text{h}}]$ | $[\text{ɪ}^{\text{h}}\text{ɪ}^{\text{h}}\text{ŋ}]^6$ | $[\text{sektə}]$                            |
| Transl. | ‘Wisconsin’  | ‘opt’                                       | ‘eating’   | ‘sector’                                    |

However, the assumption that voiceless stops in English are underlyingly unaspirated is not shared by everyone. Underlying  $[+\text{s.g.}]$  obstruents in English have been argued for in the Laryngeal Realism framework (see Iverson and Salmons 1995, Hall 2001, Honeybone 2002, among others). There are some clear virtues to this analysis. In American English, some  $/\text{t}/\text{s}/$  may undergo flapping. In environments where this is optional, the realization is always aspirated, as in *eating*:  $[\text{ɪ}^{\text{h}}\text{ɪ}^{\text{h}}\text{ŋ}] \sim [\text{ɪ}^{\text{h}}\text{t}^{\text{h}}\text{ŋ}]$ . The aspiration rules given above do not predict aspiration here. However, there is dialectal variation, and in many varieties of British English, for example, *eating* does indeed surface as  $[\text{ɪ}^{\text{h}}\text{ɪ}^{\text{h}}\text{ŋ}]$

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<sup>6</sup> We do not discuss here the complicated set of generalizations about where flapping is allowed in varieties of English.



rather than [i:t<sup>h</sup>ɪŋ]. The American English case could perhaps be modeled by applying flapping obligatorily in the environments where it is possible, and then applying an optional process  $r \rightarrow t^h$  in cases like *eating*. There is also aspiration in *Washing*[t<sup>h</sup>ɪŋ], where the only way to defend the aspiration rules above is to claim that [t<sup>h</sup>ɪŋ] represents a well-formed foot in English, a proposal which may be controversial to many. Nevertheless, we believe that it is preferable to accept this theory despite its somewhat unconventional feet, since it straightforwardly models the data on English aspiration with a small set of simple rules.

## 17 Conclusions on aspiration

We have argued that the distribution of aspiration is significantly different than what is usually presented in both textbooks and well-informed phonological analyses. We hope to have highlighted the importance of paying close attention to the full range of facts concerning aspiration in English, and in phonological datasets more generally. For example, we have dismissed the role of the syllable and the morpheme, which have been important in several earlier analyses. We have also shown that several valid generalizations about aspiration have a wider scope than previously assumed: aspiration can be blocked not only by /s/ but also by other voiceless fricatives, and aspiration affects all voiceless obstruents and not just the stops. Once all of the data are taken into account, the idea that aspiration can be captured using a single phonological rule cannot be maintained. At least three aspiration rules are necessary in our account, and with other assumptions about underlying forms perhaps more would be needed. Even when armed with this set of rules, there is little doubt that many English speakers have different grammars of aspiration which we have not accounted for here. Beyond empirical differences between speakers there is also ample scope for theoretical disagreement on the system we have provided: at many times, we have relied on particular proposals about prosodic structure which are not shared by everyone. We hope nevertheless that our setting out of the data and the generalizations will be useful in future linguistic treatments of English aspiration.

## 18 General conclusions

This chapter has focused on individual variation in English phonology and morphology, as exemplified by sibilant suffixes and aspiration. We believe that this kind of careful study is important in its own right, to ensure that the data we work with as linguists are accurate, and to remind us of how much linguistic variation often goes unnoticed. Another consequence of carefully considering the data is a new perspective on formal simplicity in analyses. We have used three rules for aspiration in English, and it is likely that for some speakers even more are needed. In some cases it will be possible to write a neat and simple analysis which accounts for the data, but in many cases this is simply impossible. Even without paying much attention to gradience and optionality, language data are often messy, and the analysis cannot be a single unified statement about where a feature occurs. Although we believe that striving for simple analyses is desirable, we should recognize that in many cases the messiness comes from the data rather than the theory or the analysis.

In addition to the points above, there is no doubt that studying individual variation is also important from a theoretical perspective. Throughout this chapter, and especially in relation to the sibilant suffixes, we have attempted to highlight that even small variations in the outputs of different speakers can justify rather striking differences in the analysis. There seems to be little in our data to justify the position that different systems simply involve minor changes to some more basic, standard analysis. Although we saw an example of this with counterbleeding and bleeding interactions for the English plural, in many other cases one small change in the data makes a large difference in the analysis. An example of this is the voicing variation in double plurals, where some speakers have [bistiziz] and others [bistisiz] for ‘beasts.’ The -iziz system involves more or less the standard rules with some minor changes to allow for the double plural. However, for -isiz it appears that the underlying form of the suffix is /s/ rather than /z/, and there is a morphologically-restricted rule of voicing rather than a phonological rule of devoicing. Studies of this type illustrate how speakers with very different grammars can produce similar outputs, and, conversely, teach us more about how very similar data can lead to speakers constructing different grammars.

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Bert Vaux is Reader in Phonology and Morphology at Cambridge University. He is primarily interested in phenomena that shed light on the structure and origins of the phonological component of grammar, especially in the realms of psychophonology, historical linguistics, and dialectology, with an empirical focus on microvariation, and nanovariation in Abkhaz, Armenian, and English.