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Quasi-phonemic contrast and the fuzzy inventory: examples from Scottish English

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1. Introduction

In this article we propose that contrast must be treated as a gradient phenomenon at the phonological level, with membership of a phonemic inventory being a matter of degree. This is because, though minimal pairs provide simple and strong evidence of contrast, things are not always so straightforward. Defining "minimal" is one challenge; as is determining which aspects of a contrast are distinctive and which redundant. Non-phonological information is sometimes a necessary consideration. These complications are usually thought to affect the analysis of a phenomenon in a discrete way, tipping the binary balance held by the phonologist towards either one analysis or another. We, on the other hand, see the necessity of evaluating contrastive evidence and of taking other linguistic information into account as being an indication that contrastiveness is a scalar property. We address some patterns in the sound system of Scottish English; ones which provide less than clear evidence of phonemicity — or, as we think, evidence of less than clear phonemicity.

First we review two consonants which are usually regarded as being part of the Scottish inventory, but which are systematically and lexically peripheral and which have been shown in our recent work to be seriously compromised as members of the Scottish Standard English (SSE) consonant inventory. From the vowel system we then present some new data relating to the unpredictability of the distribution of "long" and "short" variants of /ai/. Generally the distribution of these variants (and long/short variants of /i/ and /ʉ/) is predictable from phonological structure, hence allophonic. But part of the pattern involves what we term a "quasi-phonemic" (QP) contrast between such words as *crude* [kʰrʉd] and *crewed* [kʰrʉːd] or *side* [sʌɪd] and *sighed* [sɑed].

A number of different near-contrasts from various dialects of English of this general QP type are discussed by Harris (1990, 1994). Under the label of "marginal" contrasts, Harris (1994: 28-31) presents them as key analytic problems. Earlier, Harris had called them "derived", and though this reflects their morphologically complex nature, it uses a derivational metaphor which is better avoided. We have coined the narrower term quasi-phonemic for this class because being marginal in the inventory is a heterogenous characteristic. For example, low type and token frequency, lexically-restricted incidence and phonotactic restrictions make the status of some

phonemes marginal, such as Scottish /x/ as we will see, but the *crude* vs. *crewed* contrast is marginal in quite a different way, namely in its systematicity. We will claim that both types of marginality should be reflected directly in phonological theories.

Harris reviews a number of quasi-phonemic (QP) contrasts, of which the Scottish Vowel length Rule is just one. His suffixing examples fall into two types. One type (including the SVLR) share the general characteristic than an open syllable allophone is conditioned even when it appears before a consonantal suffix C. The QP contrast arises in the context of that consonant between the open allophone (found before suffix/clitic C) and closed allophone (found before tautomorphemic C). One of his examples is *days* vs. *daze* in Northern Ireland English in which *daze* has [ɪə] (like other cases of /e/ in closed syllables) whereas *days* (like *day*) has [ɛː] despite the coda /z/. The other type is when the suffix is syllabic. A word-final coda C (either its mere presence or some aspect of it) conditions an allophone of the previous vowel, e.g. [ɒʷ] in *roll* in London English, which is preserved on suffixation, giving rise to *molar* [aʷ] vs. *roller* [ɒʷ] (cf. also *ladder* vs. *madder* in Belfast or New York English). Perhaps the QP contrast in this case arises through the failure of syllabification of the stem-final word-internal C as an onset (in this example, the /l/ of *roller*). A morpheme-internal C (the /l/ of *molar*) must be ambisyllabic or an onset. The foot structure of *molar* vs. *roller* does not seem to differ: it is the morphological difference which is crucial. A third type, non-suffixing, is where morphosyntax or lexical class directly conditions some variant (*can* vs. *can* in US English).

The SVLR distinction between *side* and *sighed* etc. is quasi-phonemic because while there is a categorical and meaning-bearing difference between the two forms, it is one which is entirely predictable, from morphological structure. Thus the phonetic vowel differences in these Scottish English pairs, if phonologised at all (as length or bimoraicity or headedness or whatever), are in one sense *redundant* and non-phonemic (Pike, 1947). Since the redundancy is based only on non-phonological structure, we have chosen a terminology which gives precedence to the similarity of this pair to other pairs in which a minimal difference in sound makes a difference in lexical meaning while recognizing that this is not contrast in the strict sense.

Pike's seminal work is an excellent starting point for considering such issues, and much of what he had to say is strongly relevant today, and the sorts of problems we address were well known to him nearly sixty years ago, and so it should perhaps be surprising, then, that such data still seem problematic. As we will show, the more detailed empirical data we gather, the more problematic things seem to get for traditional concepts of phonology, such as a crisp distinction between distinctiveness and redundancy, between contrastive and non-contrastive phenomena.

2. What is phonological and what is not?

Lexical contrast is the defining phenomenon of phonology. As a general concept, contrast is a situation in which phonetic differences (from the obvious to the subtle) reflect and represent categorical differences in meaning. In the canonical case, namely lexical contrast, differences in sound change one word, such as *wood*, into another, such as *burning*. The categoricalness of lexical contrast arises out of semantics, but only sometimes is encoded by utterly clear articulatory or perceptual phonetic categorisation: for example, it is the *meanings* of *bin* and *bean* which are absolutely disjoint and uninterpolable, not the extensional set of each word's actual phonetic

realisations. The categoricalness of lexical contrast demands that in any particular system, such as Scottish English, two words either contrast (such as *love* and *loves*) or do not (like *pull* and *pool*): there is no indeterminacy or intermediacy. Contrasts are relatively easy to establish, and if they form the basis for phonology it follows that it is reasonable to have, as a theoretical goal, a clear-cut, modular, algebraic phonology of words and phrases.

It is obvious, however, that to develop a *theory* of phonology (in order that we can make phonological predictions about typology, acquisition, diachrony and so on), we need to follow in the footsteps of Kenneth Pike and other structuralists and consider much more than unorganised yet categorical meaningful differences in sound. First, we must develop analyses of the systems into which contrasts are organised, a process which demands that we identify the most basic contrastive units, the structures that govern their distribution, and the principles that control their behaviour. A second essential ingredient is to address systematic phenomena which complement lexical contrast, such as morphophonemic alternations, allophonic variation, stress, intonation, and other phrasal phenomena.

These theoretical necessities are intertwined: divining the minimal units of contrast means tracking their distribution in structure *even when they are not actively contrastive*. The corollary is that it is necessary to work out which of the myriad of predictable differences in sound actually constitute phonological data, and which are part of phonologically-conditioned phonetic variation. Bear in mind that since very fine-grained, variable and continuous aspects of phonetics may be language-specific, they too must be represented mentally by speakers. We see no reason not to use the word "grammar" to encompass the entire cognitive system which we, as language users, have to learn. The crucial debate in phonology is whether such fine phonetic detail is expressed in the same system that is necessary for encoding contrast (usually a symbol-processing formalism) (e.g. Boersma, 1998; Flemming, 2001); whether phonology and phonetics are disjoint (Chomsky and Halle, 1968; Hale and Reiss, 2000); or whether, in mental representations, knowledge of contrast is a fuzzy superimposition on, or abstraction from, knowledge of precise (yet predictably and continuously variable) phonetic targets (Pierrehumbert, 2001; 2002; Hawkins and Smith, 2001; Coleman, 2002; and other aspects of Boersma, 1998). We *could* hypothesise that phonetic and phonological knowledge are modularly distinct. But, as Scobbie's review (2005a) of these different approaches points out, adopting a modular architecture entails that all sound-systematic data can and must be segregated appropriately. Determining that some set of forms constitutes *phonological* data relevant to a particular *phonological* principle — or not — is theoretically crucial. Yet there is no scientific, let alone generally-agreed, basis for making such a decision. This ambiguity about the phonological status of many non-contrastive phenomena is one of the most intractable predicaments hindering advances in phonological theory.

This lack of clarity as to the remit of phonology is due to phonetics and phonology being non-arbitrarily related and to the language-specificity of much phonetic patterning. It might have been hoped that instrumental phonetic analysis (such as laboratory phonology, reviewed by Pierrehumbert, Beckman and Ladd, 2000) could provide the grounds for an "industry standard" definition of what is, and what is not, phonological data, let alone what is phonemic within phonology. But in practice it is often hard to define exactly which linguistic phenomena are truly phonological deterministically. There are even indications that in many occasions it may be impossible (or misleading) to make a definitive decision about the phonological vs. phonetic status of some phenomena on phonetic, or any other empirical grounds. The

uncertainty over a simple binary choice will, we think, increase as more complex phenomena are subjected to empirical analysis, especially when attention is paid to issues of phonological variation and change. The benefits of empiricism may be that we may gain a more realistic impression of the complexities of phonology rather than solving long-standing problems with contemporary theories.

3. Establishing inventories of segments, features, clusters and more

One of the major components of a phonological system is an *inventory* of lexically contrastive units. Such inventories are usually featural or segmental, but in principle can be compiled for any type of linguistic unit. Contrastive inventories are crucial for much cross-linguistic comparison (as in Ladefoged and Maddieson, 1995 for example) but their theoretical status is unclear.

Contrastiveness alone cannot derive an inventory: the fact that *banana* and *bounce* contrast does not take us far. Two mutually dependent initial steps in the establishment of such an inventory are required. These are the identification of: places in structure, such as the syllable onset or first element in a consonant cluster (syntagmatics); and the inventories that pertain at each position (paradigmatics).

If we limit ourselves initially to a lexically contrastive inventory, then the relevant process of identifying the units is the minimal pair test. In such a test (also called a commutation test), pairs (actually n-tuples) of lexically contrastive words must be found which differ from each other in as few potentially phonological characteristics as possible. By definition, these paradigmatic choices will be made in just one syntagmatic position. For example (and putting aside the phonetic naivety which such a phonological statement implies), *bit* and *pit* differ in only the identity of their first segment. If no "smaller" distinction between them can be found, then this establishes two phonemes (let us call them /b/ and /p/) as members of the inventory and a single distinctive feature to encode the minimal difference (let us call it /voice/).

There are often ambiguities over the dimension in which a contrast is minimal. Indeed it is often unclear whether a contrast *is* minimal. *Beat* and *bead* are usually taken to be a minimal pair, despite the fact that they differ in more than one potentially phonological dimension (this time we are not being quite so phonetically naïve). But in most analyses of English, they are said to differ phonologically (in underlying representations at least) in their final consonant alone. In those varieties of English in which there is a clear systematic vowel duration difference between them, this vowel difference is not relevant to the inventory. If it is phonological at all, it is redundant and appears only in symbolic surface structure, constrained by the grammar. Phonetically, of course, vowel duration is actually an extremely important correlate of the *beat*/*bead* contrast in many varieties of English; though not Scottish English, as we will see. The alternative approach to encoding vowel duration phonologically as vowel length is to call it phonetic. If, like most phonetic allophony, the patterns of vowel duration are subtle, gradient and variable, then they may not be part of surface structure or constrained by symbolic phonological grammars at all. Distinguishing phonological from phonetic allophony is an extremely thorny issue, but is absolutely crucial in surface-oriented phonological theories. A theory of phonology comprising only constraints on surface structure requires a definition of what surface structure is, and what phenomena it represents. Indeed, any theory of phonology needs to define what its "surface" level of representation which contains non-contrastive phonological categories, and state what it is *for* (Scobbie, 2005b; Ladd, 2006).

A final point is that commutative comparisons such as the minimal pair test are limited to paradigmatic substitutions at one place in structure, so cannot be used to establish the inventory across different syntagmatic positions. The concept of a cross-positional phonemic inventory requires further appeals to phonetic similarity and well-formed inventories.

In the face of such indeterminacy, phonological research cannot simply maintain the status quo. More detailed research into these fundamental concepts is clearly required. *Can* the discovery procedures of Pike be amended for today and completed? Or is the indeterminacy of descriptive phonology not a failing, but an indication of a deeper theoretical indeterminacy which should be embraced by theoreticians? We now approach these questions by considering some of the problems relating to the segmental inventory and contrastive content of Scottish English.

4. Scottish Standard English

Native Scots whose grammar and lexis can be classed as Standard (International) English speak with a variety of different accents — of course. For the most part the variation in any geographical location within Scotland is, following Aitken (1984) and Abercrombie (1979), seen as a continuum from a local "broad" sound systems with deep roots at one end, to, at the other, varieties influenced in large measure (but usually indirectly and at some considerable historical or social remove) by the standard variety spoken in England. The latter non-vernacular end of the continuum shows, naturally, far less geographical variation within Scotland.[1] Somewhere between a local vernacular variant of Scots and what would be seen as a foreign Anglo-English is Scottish (i.e. Scottish-accented) Standard English, "SSE" (Abercrombie, 1979; Scobbie, Hewlett and Turk, 1999). It is impossible and undesirable to draw a clean line between such varieties, but our goal here is to probe the problems which arise when considering the structure of any phonological system, in this case SSE, due to system-internal ambiguities over the contrastive phonological status of particular phenomena.

So, Standard English (e.g. as written here) when spoken in Scotland is different from American or Southern Standard British English essentially in its sound system, by definition, with a few minor systematic differences elsewhere, such as the existence of the preposition *outwith* and the grammaticality of *needing washed*. To go from SSE towards Scots, on the other hand, means greatly altering lexis, lexical incidence, morphology, morphosyntax, idiom and to some extent syntax, and (again) the sound system.[2]

When distinguishing the various local versions of Scots from SSE in terms of "accent", i.e. sound system, we think it is not sufficiently clear that few of the aspects characterising the SSE sound system from Scots are strictly *phonological*. What *is* appreciated is that SSE and Scots are still remarkably similar, and are clearly closer phonologically than SSE and RP typologically. What is *not* stressed is that the potentially very distinct sound systems of SSE and Scots differ primarily in lexical

[1] The effects of population movement and dialect contact are fundamental but additional complications which we cannot address here, as we will attempt to focus as narrowly as possible on phonological issues. For some of the necessary breadth, see Stuart-Smith (2003).

[2] For example, see Matthew Fitt's translation into Glasgow Scots: "Zeus, high-heid-yin ae the gods an heid-bummer ae the universe, had a son an he cawed this son Heracles. Heracles was strang as a buhl. He wis built like a hoose-end an had erms like a boxer an legs like cabers. Heracles wis feart at naebody, except his step-maw Hera." (Fitt, Rennie and Robertson, 2002).

incidence, the membership of lexical sets, morphophonemics, and even in what phonologists usually call "low level" phonetics, as any sociophonetic study can show. Differences in phonemic inventory and phonotactics are more trivial. Even varieties of broad Scots whose phonologies are most different to SSE, such as Shetlandic (van Leyden, 2002), have segmental inventories which bear closer typological similarities to SSE than SSE does to many other well-known varieties of English. This is not to say that the differences in phonetics and lexical incidence are trivial. As well as being able to cause severe problems for interspeaker intelligibility, they are important characteristics of sound systems with complex geographical, structural and sociolinguistic distributions.

5. The consonant inventory of SSE

In this section we concentrate on peripheral items in the consonant inventory of Scottish English and the varying reasons for the dubious status of certain consonant phonemes. For more details and full methodology see Stuart-Smith's various publications based on empirical data gathered from a socially-stratified pool of 32 speakers from Glasgow (Stuart-Smith, Timmins and Tweedie, submitted; Stuart-Smith, 2003) and references therein (though especially relevant is Macafee, 1983).

5.1. Overview

Generally speaking, the Scottish consonant inventory is familiar from other varieties of English: /p t k b d g tʃ dʒ f θ s ʃ v ð z ʒ m n ŋ h r l w j/. These 24 consonants comprise a relatively simple core, though there are some well-known analytic problems common to many varieties of English: the complementary distribution of /h/ and /ŋ/; the status of /ŋ/ as a segment rather than a sequence; the skewed phonotactics and low functional load of the /θ/-/ð/ contrast (and the ongoing loss of /θ/); the difficult status of post-vocalic /w/ and /j/; the roles of [ʔ] as an allophone of /t/ and as a delimitative marker; and others. The liquids /r/ and /l/ are also of great phonological interest, especially with respect to coda weakening and sandhi, but since there is little argument that SSE at least *has* an /r/ and an /l/, we will forego further discussion of these crucial consonants for now.

5.2. The velar fricative x

This non-sibilant voiceless fricative phoneme is limited phonotactically to the coda, appears primarily as a singleton and not often in clusters, favours word-final to word-medial contexts and has a highly limited lexical frequency outwith proper names. Informal observation indicates that younger SSE speakers have difficulty thinking of even a handful of words containing /x/, such as *broch* or *loch*. (These words, whether with their /x/ intact or not, have been borrowed into standard English.) The phoneme is more commonly preserved in place names and surnames (and so *Naughty* may have /x/ when a surname even if not when a regular lexeme) and indeed is productively applied to non-English names and words, whether spelt with coda "ch" (*Munich*, *Bruch* and *Bach*), or not (*van Gogh*, *Ahmed* and *Khomeini* with a structurally rare onset /x/).

Despite a limited distribution, the use of a [x] sound in *loch* and the contrast with *lock* are still highly salient for many SSE speakers, and a failure to use [x] may be explicitly brought to the attention of foreigners, including native English speakers. The use of [k] in *loch*, in particular, can cause social offence far beyond any strictly linguistic basis. Even so, /x/ is losing ground among young urban vernacular speakers (Lawson and Stuart-Smith, 1999; Stuart-Smith *et al*., submitted) and even rural Scots speakers (Marshall, 2004). There are relatively few borrowings into SSE with /x/, and it is far more common in self-evidently Scots lexis (*bourach*, *dicht*, *teuch*, *dreich*, *pech*).[3] SSE speakers will use such Scots lexis only in some contexts (e.g. literary or social ones), and if they are used, it is important they are pronounced "correctly", i.e. with /x/.

In SSE, the high social salience of the phoneme /x/ and the minimal pair *lock*/*loch* seem to provide evidence for the inclusion of /x/ in the inventory, despite its extremely marginal structural status, low functional load, low type and token frequency and propensity for merger with /k/ among many speakers.

Structurally, coda-based [x] and stressed-onset based [h] could be synchronic allophones. They are largely speaking in complementary distribution, and are both non-strident voiceless fricatives. Phonetically, hyperarticulated onset /h/ is sometimes heard to have some [x]-quality, whereas coda [x] is acoustically weak with smooth velar frication. Indeed, heavily weakened /x/ approaches the quality of a devoiced vowel after high or back vowels. (Perhaps we should discount the self-confident handful of speakers who claim to have *Docherty* as [ˈdɔx̬ɹ̥te] and *Doherty* as [ˈdɔʰɹ̥te]. It may say more about the similarity between /h/ and /x/ and the potential for mutual substitution than about a potential for contrast, or be another peripheral aspect of the phonology which is spelling-induced.)

5.3. The voiceless labial-velar ʍ

This consonant is limited phonotactically to onset and appears in no clusters. It is of very limited type frequency, but because it appears in "wh" grammatical words, has a fairly high token frequency. There are a number of minimal pairs (*which* vs. *witch*, *whether* vs. *weather*, *whales* vs. *Wales*) which can be seen as strongly supporting the status of /ʍ/ as a member of the inventory. However, for the majority of English speakers in the UK these pairs are homophonous, and SSE speakers vary in how aware they are of the contrast if they have it themselves. These factors may explain the persistence of the popular Scottish children's joke: "How do you get two whales in a Mini?" which relies on a [w] in *whales*.[4] Lawson and Stuart-Smith (1999) and Stuart-Smith *et al*. (submitted) present quantitative evidence for the weakening and loss of the requisite phonetic distinction which underpins the contrast among younger speakers who are generally thought to continue Scots in their vernacular, where the contrast is always thought to have been strong (see also Johnston, 1997). Their use of [w] is indicative of a merger, which is echoed by the tendency of highly Anglicised speakers to merge /ʍ/ and /w/. But on the whole, SSE still contrasts these pairs.

One of the main phonological problems with /ʍ/ is where it *goes* structurally in the inventory. It seems usually to be regarded as a fricative, yet, inconsistently, to be the voiceless counterpart of the approximant /w/. Alternatively, it may be seen as a cluster

[3] Scots lexis can be glossed at the *Dictionary of the Scots Language* online: http://www.dsl.ac.uk/dsl/
[4] The answer is: "Go down the M6 motorway and turn right."

/hw/ — in which case /ʍ/ would not be part of the inventory at all. The existence of clear contrast does not solve the analytic problem of phonemicity.

The main argument against the cluster analysis would be that it creates the *only* cluster in which /h/ would be involved synchronically. And although /w/ appears in several, only /sw/ is well-supported lexically (*sweet*, *swan*, *switch*). Examples of /bw/, /dw/, /gw/, /fw/, /θw/ and /ʃw/ are rare and/or often involve marginal lexemes (*Buenos Aires*, *dwarf*, *Dwight*, *Gwen*, *guano*, *Fuentes*, *foyer*, *thwack*, *Schweppes*) and such argumentation is usually used to establish that a complex segment is not a cluster, but a singleton phoneme. However, /hw/ need *not* be the only /h/ cluster in SSE, given other analytic possibilities. Specifically, it may be partnered by the cluster /hj/ e.g. in *huge*, so long as /ju/ is not regarded as a diphthong /iu/, another long-standing indeterminacy of the vowel inventory of English.

These clusters would be phonologically parallel: they are the pair /h/+glide. Additionally, they are phonetically parallel because in production they are very segment-like with little internal sequencing of voice. Generally /hw/ is [ʍ], while /hj/ is [ç]. Finally, note that some SSE speakers who avoid /j/ in clusters have a pattern in which both are reduced to their glide (*which* with [w] and *human* with [j]), whereas the reduction of the cluster /nj/ in *new* is to plain [n].

So even with clear contrasts in those speakers who have not lost it, the status of /ʍ/ is actually in the balance. With its low frequency and without any clear position in the structure of the consonant system, this "Scottish consonant" has a reasonable claim to be a marginal cluster rather than a marginal phoneme.

6. The Vowel Inventory

We will focus here on one particular phonological vowel system, one commonly discussed in phonological research on SSE. This system is widely found in the fifty-mile span that encompasses Glasgow (the largest city) and Edinburgh (the capital). Several million speakers, the bulk of the Scottish population, live in a number of conurbations in this Central Belt. The starting point for a SSE phonemic inventory are the twelve lexically stressed vowels of Abercrombie's "basic" Scottish vowel system (Abercrombie, 1979). It has five free monophthongs /i e ɔ o ʉ/ (*pea*, *pay*, *paw*, *po*, *pooh*), four checked monophthongs /ɪ ɛ a ʌ/ (*pit*, *pet*, *pat*, *putt*), and three free diphthongs /ai au ɔi/ (*buy*, *bow*, *boy*). SSE lacks a number of tense/lax or monomoraic/bimoraic pairs which are common to other dialects of English. *Pam* and *palm*, *cot* and *caught*, *pool* and *pull* are homophones.

Abercrombie notes that some speakers have additional vowels that can be, in principle, easily established through a minimal pair test. Under the influence of Anglo English, for example, speakers may distinguish *Pam* and *palm*, in which case we would add /ɑ/ to the inventory for *palm*, or, more rarely some other contrasts. The context for our discussion is the readily-established and uncontroversial basic system. in which

6.1. The Scottish Vowel Length Rule

The phenomenon in Scottish English which has received most interest from phonologists is the Scottish Vowel Length Rule (SVLR) (Aitken, 1981; Giegerich, 1992; Scobbie, Turk and Hewlett, 1999; Scobbie *et al*., 1999a and many others). This

is the name given to the complex but mostly *predictable* distribution (hence "rule") of "long" and "short" allophones of vowel phonemes as conditioned by various factors: phonological, phonetic and morphological. To simplify things:[5] in word-final stressed syllables, "long" allophones (i.e. those with greater phonetic duration) occur in open syllables and before voiced fricatives and /ɹ/; "short" allophones occur before stops (including voiced ones, crucially for what follows), nasals, voiceless fricatives and /l/. Following McKenna (1988), Scobbie *et al.* (1999a) and Scobbie (2005a) show that among the monophthongs, /i ʉ/ stand out as having a particularly strong phonetic duration effect, while with /ai/, quality and quantity interact in a particularly revealing way.[6] Establishing exactly which vowels are subject to a phonological SVLR and which vowels are subject to a similar but phonetic pattern remains an absolutely fundamental problem — if, that is, it is thought to be important to separate phonology from phonetics in a sharp modular way.

Many of the phonological discussions of the SVLR focus on the challenge of formalising what "length" means for /ai/, linking that to /i ʉ/, and distinguishing short /i/ from lax /ɪ/ (cf. Escudero and Boersma, 2004 for an empirical study related to the last opposition which indicates it tends to be one cued by quality more than duration). Such issues are important whether the SVLR length distinction is underlying or derived.

6.2. Quasi-Phonemic Contrast involving i ʉ ai

As noted, word-final open syllables condition long variants of /i ʉ ai/. When suffixed by /d/ the vowel duration is not short as it is before tautomorphemic /d/ (or /t/) as might be expected under the SVLR.[7] Instead, a long vowel is found, giving rise to something rather like a minimal pair with any word with the same sequence of phonemes (as established up to this point) but in which the final /d/ is tautomorphemic (1-3). Near pairs, which are more common, are in parentheses.

(1) need ≠ kneed, (greed ≠ agreed)
(2) crude ≠ crewed, brood ≠ brewed, rude ≠ rued, pud ≠ poo'd, mood ≠ moo'd, would ≠ wooed, (Jude ≠ subdued [sʌbdʒʉːd])
(3) side ≠ sighed, tide ≠ tied, (ride ≠ tried)

These differences bear the hall-marks of phonemic contrast, namely a categorical difference in meaning consistently attributable to the presence of a phonetic distinction, but structurally the vowel differences are predictable. The long vowel duration could be attributed to the morphological context directly, or indirectly if a

[5] We are going to over-simplify the following characterisation, so that we can move on to considering the facts in the next section which relate to contrast in more detail. The difficulties in characterizing these non-contrastive aspects of the SVLR are no less problematic, and are the focus of on-going research.
[6] In unpublished work we show that social factors conditioning /ai/ variation are also crucial to understanding the phonological and phonetic aspects of /ai/ variation.
[7] This may be true of some other level 2 suffixes, such as *-ness*, *-ly*, which begin with a shortening consonant, or compounds, but the anecdotal claims in the SVLR literature about this are not supported by actual data and we doubt anything is as simple as it might appear. Bare /d/ as a clitic version of *had* or *would* probably condition long vowels in the words they attach to, but pronoun combinations (*he'd*, *you'd*, *I'd* etc.) typically are short in connected speech, being unstressed.

different prosodic structure is proposed. Alternatively, different long/short phonemes could be allocated to different lexemes (albeit on a completely predictable structural basis). The actual analysis does not matter here: the first important point is to note that if the distinctions in (1-3) are not encoded segmentally, then each pair will be phonologically identical in prosody-free underlying representation. Second, if a predictable prosodic distinction were to be introduced then this does not theoretically determine whether the vowel distinctions *are* encoded segmentally, as moraicity or vowel length (say), in Scottish English surface representations, i.e. as phonological allophones. Third, a phonological difference at either underlying or surface level in segmental content, including duration, means that there will be six phones corresponding to /i ʉ ai/. (Since prosodic structural differences are segment-independent, it is impossible without further segmental machinery to limit the SVLR to just a subset of all vowels able to appear in open syllables.)

Even if there are six phonological phones, this situation does not mean that all are part of an inventory, partly because derived or redundant structures are not generally accorded this status. However, inventories incorporating redundancy are crucial to understanding phonologisation, are utterly fundamental to surface representations and hence to constraint-based phonology (Scobbie, 2005a), and are worthy of theoretical consideration in their own right (Ladd, 2006). We should probably be considering inventories of contrastive dimensions rather than mere segments, because, as Archangeli and Pulleyblank (1994) so clearly point out, segmental vowel inventories are misleadingly large if a basic five vowel system inventory (say) is multiplied 16 times by contrastive binary tone, length, nasality and ATR. In the SSE case, the relevant question therefore might be better asked: does the system have three degrees of length, or both tenseness and length, in *bid*, *bead*, and *freed*?

Support for including length with unarguably contrastive dimensions comes from the strength and categoricalness of the distinctions in (1-3). These differences seem indistinguishable from phonemic contrast from the perspectives of native speaker intuition and phonetic output, and are just as important in characterising the phonology of SSE. Note also that Matthews (2001) shows that the variants of /i/ and /ai/ (as allophones, before voiced and voiceless fricatives) are early-acquired. Unlike true phonemic contrast, however, the categorical meaning differences in (1-3) have a component of predictability in meaning tied to the morphology. Straightforward phonemic contrast does not simultaneously encode a morphological, syntactic or other non-phonological general meaning, nor be conditioned by structure, in addition to a single difference lexical meaning involving one morpheme versus another.

In previous publications we have reviewed the phonetic distributions underpinning a categorical SVLR difference, as well as presented durational and formant analyses of the speakers analysed here. These studies confirm that it is only /i ʉ ai/ that show quasi-phonemic contrast. In other words, the phonetic vowel duration in each of the pairs in (4-8) are no different, despite claims in the literature that they show the same contrast as the pairs in (1-3). We find these claims very interesting, and suspect that a thorough empirical analysis of the native-speaker intuitions on which those claims were based will be an important future addition to the literature. It may be that intuitions about differences are based on morphological / prosodic structure and generalised from just only /i ʉ ai/ in which they do appear phonetically onto those where, in natural speech at least, there is no distinction.

(4) ode = owed, road = rode = rowed

(5) odd = awed, nod = gnawed
(6) grade = greyed, (afraid = frayed)
(7) aloud = allowed
(8) Boyd = buoyed, (avoid = annoyed)

6.3. Distribution and intuition: i ʉ ai in word-final stressed syllables

The few examples of QP contrast for /i ʉ ai/ presented in (1-3) above ought to have raised some doubt about the generality of the phenomenon, with some justification. There are indeed limited numbers of such pairs, which may imply this QP contrast is a peripheral or weak phenomenon (though recall even a handful of examples of the /x/-/k/ contrast are sufficient to establish the existence of /x/). But as has been mentioned already, the existence of minimal pairs is not the only fact that supports the adoption of a segment in a language's inventory. In this case, because short /i ʉ ai/ are found before voiceless stops, the normal voicing effect on vowel duration is minimal (9). There are therefore also short-long pairs (10) in which the voicing difference confounded by the morphology conditions a clear difference in verbs ending in /i ʉ/ and particularly /ai/. Furthermore, all words in the long vowel context are comparable whether the words happen to exist as members of minimal sets or not. The QP contrast is thus thoroughly supported through comparison between various incomplete sets. Finally, suffixed pseudo words, neologisms and nonce verbs (11) seem always to have long vowels, entirely consistent with the pattern.

(9) bleat ≅ bleed, seet ≅ seed, put ≅ pud, newt ≅ nude, bright ≅ bride
(10) skeet < skied, cute < cued, trite < tried, fright < fried
(11) he sky'd the ball, she tree'd the avenue

On the other hand, there are some examples in which the "wrong" vowel duration shows up. There may be specific lexemes, like *dude*, or *vibes*, in which a long vowel is unexpectedly found for some speakers. Scobbie (2005c) presents pilot empirical results to clarify the extent and range of such "unpredictable" vowel lengths. For example it seems that final /b g dʒ/ may be more likely to condition a long variant than final /d/ especially in sparse prosodic neighbourhoods, (e.g. the rare coda /ib/), probably indicating that the functional pressures to maintain the quasi-phonemic contrast and to lengthen vowels before voiced stops are greater than the pressure to ensure paradigm uniformity for new or uncommon words. The literature (e.g. Aitken, 1981) is more reliable when reporting strong phonotactic generalisations such as long /ai/ before final /θ/ (*Forsythe*, *Rosyth, blythe*) than when reporting the vowel length of individual lexical items. Even so, caution should be exercised until new data is available, on word-internal contexts in particular, as will be clearer when we present the first such results below.

The fact that speakers can have clear intuitions and exceptional lexical specification of long or short variants of /i ʉ ai/ serves to underline the near-phonemic status of the length "contrast". The difference between long and short variants may be structurally allophonic much of the time, but when it is phonologically unpredictable, or when the distribution of long variants becomes highly detailed, the claim that both long and short variants are members of the inventory is strengthened.

In addition, there is some evidence (again largely anecdotal introspection) from level one morphophonology that short /ai/ exists in underlying representation and is not lengthened at level 1, strengthening the case that each variant should be represented in the SSE inventory. For some speakers it appears the irregular plurals of *life*, *wife*, *knife* may be *lives*, *wives*, *knives* with a short /ai/, despite the medial fricative being voiced in the derived environment. On the other hand, *lifes*, *wifes* and *knifes* are also fairly common plurals in otherwise standard speakers (with short /ai/ transparently before /f/), as are the irregular plurals with long vowels. More research is needed on these forms. For /i ʉ/ the evidence is even less clear, but we do not think anyone has ever claimed that irregular *hooves* or *leaves*, for example, may have a short vowel before a voiced fricative.

6.4. Unpredictable lexical incidence of variants of ai

It has previously been observed by Aitken that the choice of /ai/ variant in stressed non-final syllables (e.g. in trochees) is even more complex than presented above. For example, he claims that words like *spider* and *cider* have long /ai/ followed by /d/, whereas, if word-internal distribution is the same as word-final distribution, they should have short /ai/ before /d/. Again, such claims are based on introspection and observation rather than on any systematic fieldwork or experimentation and should be taken as a starting point only.

These trochaic patterns are particularly interesting for phonological analysis because, with /ai/ being word-internal, there is no opportunity for quasi-phonemic contrast. It would appear, however, that for many speakers, it is still possible to have a very clear intuition about which variant of /ai/ appears in a given lexeme and for a transcriber to be able to clearly judge very clearly which variant was actually produced. It is thus often possible to draw a SSE informant's attention to the *side*/*sighed* quasi-contrast, and ask which of those two vowels appears in some trochaic word of interest, such as *psycho*, and get a very clear answer that it is one or the other. Note however that there are some speakers who are completely baffled by such a question, or report that the vowel is intermediate or unclear. For them, the variants are presumably either not part of the SSE segmental inventory in the same way as true contrastive vowels, are not part of the inventory in this word-internal context (a polysystemic approach) or are not part of it at all.

We report here some transcription-based findings from Stuart-Smith's large study of Glasgow speech (see references above). Recall that this large-scale study was of a pool of 32 speakers, who were stratified in order to sample SSE and Glaswegian Scottish English. The subjects were either young "Y" (in their mid-teens) or old "O" (40s-60s), male "M" or female "F", and from Bearsden "Bden", a largely middle class suburb of Glasgow, or from Maryhill "Mhill", a largely working class area of the city. As far as we are aware, this is the first empirical investigation of trochaic /ai/.

A number of /ai/ words (where "word" includes high frequency semi-bound morphemes) were incorporated into a wordlist. We focus here only on transcriptional native-speaker judgments of length in these trochaic materials, though we have made extensive (mostly unpublished) transcriptional and duration/formant analysis of /ai/ in monosyllabic (Scobbie *et al*., 1999b) and trochaic words which back up these judgements. Each speaker's /ai/ in simple and trochaic environments was transcribed on two occasions from digitised tape by the first author, and the rare discrepancies resolved by further speaker-internal comparisons. Unlike /i/ and /ʉ/, the short and

long variants of /ai/ have a strong qualitative distinction which makes identification of the variant fairly simple once the transcriber has a model for their acoustic space based on the simpler monosyllabic lexemes.

Table 1. Summary of results for OM, OF and YM subjects. White cell with "s" = short /ai/, empty white cell = long /ai/, and a diagonal line indicates variation.

bible	sidle	libel	micro	nitro	hydro	title	tidal	pylon	crisis	miser
s	s					s	s			

Full results for the older men (OM) and women (OW) and young men (YM) are reported in the appendix, but can be summarized as follows (Table 1).[8] In general, *bible*, *sidle*, *title* and *tidal* are pronounced with short /ai/. *Crisis* is generally short, but may be long among older (especially older male Bearden) speakers; thus length may be a social variable among older speakers in (some) words in which /ai/ is followed by a voiceless fricative. *Miser* is long, as are *pylon*, *hydro*, *nitro* and *micro*. *Libel* is long among the older speakers, but was largely unfamiliar to and mispronounced by the young males (and of the three who managed it, it was long for two and short for one). Two young males stood out because they had a long vowel in *micro*.

Phonologically, these results exemplify a near contrast (*bible* vs. *libel*) which has often been reported anecdotally, and the preservation of short /ai/ in polymorphemic words based on a closed syllable stem which itself has short /ai/ (*tide* = *tidal*). A completely new result is the interspeaker consensus about short /ai/ before voiced stops in *bible*, *sidle* vs. long /ai/ before voiceless ones *nitro*, *micro.* This shows that the voice and manner of the consonant following /ai/, if it is relevant to the choice of /ai/ variant, is only one aspect of a more complex set of factors. This conditioning system may either be segmentally non-local or possibly prosodic: it seems (from other pilot data) that the nature of the weak syllable, in particular its rhyme, is crucial in conditioning /ai/ variants. For /ai/ plus a voiceless fricative, for example, we suspect a short vowel may be more common in some "long-distance" contexts, e.g. in a trochee terminating in a lateral or rhotic (*rifle*, *cipher*), but a long vowel may be more common in others, such as a trochee terminating in a nasal, obstruent, or vowel (*hyphen*, *Pisces*, *ISA*). Perhaps another way to approach these results is to say that such words are not trochees, but a strong-week sequence of two monosyllabic feet (like *gymnast*), but it is not clear that shifting the problem onto footing is a revealing step. Rather, we expect gradience.

For example, we suspect that voiced fricatives will generally condition more long vowels than voiceless ones, both in terms of their distribution and in terms of the number of lexemes affected. Further, we suspect that stops and other post-vocalic segments will not pattern identically to fricatives. Overall, these complex conditioning patterns will offer statistical prediction of long and short variants, which is another way of saying the variant of /ai/ is partially unpredictable.

Word-internal /ai/ in obviously non-trochaic contexts may be a little less complex and a little more predictable. A long variant appears foot-finally, even when the post-vocalic consonant is a voiceless fricative (*typhoon*). And footing may determine whether morpheme-final /ai/ is short (*bicycle*) or long (*bisect*).

[8] OF Speaker 4 from Bearsden has uniformly long /ai/, reflecting her accent generally, which is Anglicised and therefore not really typical of "basic" SSE.

Turning back to the unpredictability of variants, the behaviour of *libel* suggests an underlying contrast somewhere with *bible*, but the problem is identifying where it is. It may be short vs. long /ai/, the prosodic structure, the syllabification of the /l/, or the presence of a phantom vowel in *libel* (cf. *libellous*). Polysyllabic *tidal*, on the other hand, exemplifies faithfulness to the vowel in *tide*. Aitken suspected an incipient phonemic contrast arising out of these complex distributional generalizations, even though we doubt he perceived just how complex the predictable contexts could be. The very preliminary data in Table 1 offers some support for this view.

Table 2. Results for young female subjects. White cell with "s" = short /ai/, empty white cell = long /ai/, grey cell = no data due to a subject error in reading the word.

			bible	sidle	libel	micro	nitro	hydro	title	tidal	pylon	crisis	miser
YF	Bden	1	s	s			s		s	s		s	
		3	s	s		s	s		s	s			
		4	s	s		s			s	s		s	
		5	s			s			s			s	
	Mhill	1		s					s	s		s	
		2		s					s			s	
		3	s						s	s			
		4	s	s		s	s		s	s		s	

We turn now to individual results from the young women (Table 2), and find a very different pattern — or lack of it. First: there are many examples of /ai/ with a length (short or long) which had not been seen in other speakers above; second there is a great deal of interspeaker variation; third, phonotactically similar words may have different length vowels. For example, some speakers have an unexpectedly long /ai/ in *bible*, in *sidle*, or in both. Some speakers have an unexpectedly short /ai/ in *micro*, *nitro*, or both. Indeed no two speakers have the same system, and though this may be due to lack of data, we suspect that a larger wordlist would have elicited even more variation in the lexical incidence of short and long /ai/.

These speakers offer support for lexical specification of short and long /ai/, because some of the individual distributions are unlikely to be systematisable on general phonotactics grounds, even complex ones such as were hypothesised above. It is always possible, however, that these 14-year old subjects had not yet learnt the distribution of short and long /ai/, and that there is no language-change aspect to these results. But interpreting Table 2 as a pattern of late acquisition does not solve the problem of the phonemic status of the SVLR variants, and simply underlines the ambiguous, indeterminate and complex nature of the phenomenon in a different way.

7. Summary, discussion and conclusions

We have considered some of the difficulties in establishing the consonant and vowel inventories of Scottish-accented Standard English (SSE) on *phonological* grounds. It must not be thought that these difficulties arise due to sociolinguistic or stylistic variation, and that they can be dismissed as just so much "noise" by researchers whose focus is exclusively phonological theory. We think that any variation presented above is relevant to phonology in the narrowest sense. This does *not* imply that we

think sociolinguistic variation is irrelevant to phonology, indeed, quite the opposite. Rather, we think that strictly modular phonology is both based on unrealistic and arbitrary data while at the same time being theoretically limited and unable to deal with phonology's interactions with other modules (Scobbie, 2005b; Foulkes and Docherty, 2006; Stuart-Smith, 2006).

The contrastive inventory of Scottish Standard English, like any language, offers a number of phonologically uncertain phenomena, and the SVLR is perhaps the most complex of these. In addition to the structurally-conditioned quasiphonemic contrast in word-final stressed syllables, we examined word-internal /ai/, which has two clear variants. These function as allophones in some contexts, have a QP contrast, and also appear unpredictably when word internal (in the first syllable of a trochee). We presented new data on the lexical incidence of long and short /ai/ from a small empirical study of 32 speakers. In the young female subjects, it is not possible to predict with certainty the lexical incidence of short or long /ai/, whereas the appearance of the variants in other speakers appears to follow statistically certain phonotactic regularities. This unpredictable lexical incidence adds weight to the near-phonemic status of the variants of /ai/, since they seem to have to be specified lexically. Other facts relating to /ai/ may also lend support to the near-phonemic status of both variants, without tipping the balance decisively over. For example, Scots dialect has marginal minimal pairs like *gey* [gʌɪ] "very" vs. *guy* [gɑe], though speakers with a *gey*/*guy* contrast may the straightforward QP contrasts described here, a situation which requires further research.

We thus do not offer a solution to the question of whether /ai/ is one member of the inventory of SSE or two. One reason for this is that we hope to leave the reader with the same sense of unease which we feel about the requirement to adopt one ill-fitting and rigid phonological analysis over another. An uncontroversial analysis may be possible given more evidence, but we doubt it. In our experience (and we are adding little here to what was said explicitly by Pike, 1947) *every* language has a rump of potential / actual near-phonemes. These problematic segments are characterized by such factors as low functional load, limited phonotactic distribution, contrast in only a limited phonotactic or grammatical environment, few or no examples of real minimal pairs, speaker intuitions that are variable or at odds with the distributional facts, late acquisition, unpredictable lexical incidence, lexical stratification (so that contrasts may only be found in names, loan words, sub-lexicons etc.), interference from literacy, patterns of variation and change, complex phonetic correlates, abstract cross-positional (e.g. onset to coda) relationships, ambiguity over whether they are singletons or clusters, and low participation in phonological processes.

In SSE, as with every language, the evidence for the contrastive/phonemic status of some segments will always be weaker than it is for others. All contrasts have different functional loads, and some play a very small role in the language. Are subtle differences in phonemicity *outside* or *inside* phonology? From the point of view of phonology, are all phonemes equal? We think the answer is that some contrasts are more contrastive than others, and that this is not merely to say that the functional load of contrasts varies, because while the load on /x/ vs. /k/ may be low, making it peripheral to the inventory, the contrast is clearly phonemic. On the other hand, the SVLR QP contrast is functionally a bit more important, but there are few minimal pairs and the distinction is in part predictable — so the contrastiveness is weak in a quite different way.

Our approach means that phonology should reflect more closely the patterns in the data, or be clearer about how it has abstracted away from them. We think here

particularly of "exemplar" approaches (Pierrehumbert, 2001; 2002; Coleman, 2002) which allow a greater flexibility in the way phonological systems interact with phonetics, the lexicon and sociolinguistics. Specific parts of such interactions are explored by Boersma (e.g. Boersma, Escudero and Hayes, 2003, Boersma, 1998), Gafos (2006), Foulkes and Docherty (2006), and Scobbie (2006). One thing which we did not mention above which is relevant is that the *phonetic* distinctiveness of /k/ and /x/ on the one hand and /w/ and /ʍ/ on the other is also weakening (Lawson and Stuart-Smith, 1999), tying categorical and phonetic changes together in this case. Other changes (e.g. the derhoticisation of coda /r/) involve shifts in the cues used for a contrast, with resulting systematic re-organisation.

Our position is that it is unsatisfying to have to adopt one concrete solution to the problematic patterns outlined above. Such models fails to accept that the individual's grammar can capture and represent the partial, indeterminate and fuzzy nature of phonological phenomena, even if they accept that the phonetic instantiation of phonological categories can be vague and variable "underneath". In this regard we disagree absolutely and fundamentally with Pike (and with mainstream generative phonology) that "ultimately, only one accurate analysis can be made of any one set of data" (Pike, 1947: 64). For the "easy" parts of a language, there may well be an obvious and straightforward analysis, but on the periphery, where things get interesting because phonology is undergoing change, is hard to acquire, or is highly marked, it is reasonable to think that the mind of the speaker can have alternative or intermediate solutions to the incomplete and ambiguous paradigms that surround them. (Furthermore, intra-speaker variation supports this view.)

Our view is that indeterminate phonological data cannot be explained by models which presuppose that phonology provides unique solutions. An exemplar approach seems to allows messy and ambiguous facts to percolate into analyses better than many. Assigning labels akin to distinctive features to phonetic distributions and then assuming that grammars range over labels basically modularises phonetics and phonology too much, unless the labels are so fine-grained that we end up questioning whether they are anything other than a notational variant of the exemplar approach. Exemplar analyses, by being non-deterministic and fuzzy, predict variation, subregularities, gradual phonologisation, and "nearly" phenomena like quasi-phonemic contrast. An unequivocal phonological system cannot be determined empirically from equivocal data. Phonology is an analytic framework in which core concepts like contrast and categorization are emergent, flexible, gradient and non-deterministic.

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Appendix

Table A. Results for other subjects. White cell with "s" = short /ai/, empty white cell = long /ai/, grey cell = no data due to a subject error in reading the word.

			bible	sidle	libel	micro	nitro	hydro	title	tidal	pylon	crisis	miser
OM	Bden	1	s	s					s	s			
		2	s	s					s	s			
		3	s	s					s				
		4	s	s					s	s			
	Mhill	1	s	s					s	s		s	
		2	s	s						s		s	
		3	s	s					s	s		s	
		4	s						s	s		s	
OF	Bden	1	s	s					s	s		s	
		2	s						s	s			
		3	s	s					s	s		s	
		4											
	Mhill	1	s	s					s	s			
		2	s	s					s	s		s	
		3	s						s	s			
		4	s	s					s	s		s	
YM	Bden	1	s						s			s	
		2	s	s					s	s		s	
		3	s	s					s	s		s	
		4	s	s					s			s	
	Mhill	1	s	s	s				s	s		s	
		2	s	s					s	s		s	
		3	s	s		s				s			
		4	s	s		s			s	s		s	
YF	Bden	1	s	s			s		s	s		s	
		3	s	s		s	s		s	s			
		4	s	s		s			s	s		s	
		5	s			s			s			s	
	Mhill	1		s					s	s		s	
		2		s					s			s	
		3	s						s	s			
		4	s	s		s	s		s	s		s	
			bible	sidle	libel	micro	nitro	hydro	title	tidal	pylon	crisis	miser