

The Structure of English: Morphology and Phonology

Week 3: Inventories and allophones

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Introduction

In Week 1 the terms phoneme and allophone were introduced. The phoneme is a disputed concept in phonetics and phonology, but a segment-sized unit forms the basis of phonemic transcription and most phonological theories. The phoneme was defined on a working basis as a minimal unit of contrast. Phonemes can be determined on the basis of possible (not just existing) distinct lexical items. So, for example, the words 'cat' /kat/ and 'cap' /kap/ differ in the quality of the final sound. In 'cat' this is a voiceless alveolar stop, and in 'cap' it is a voiceless bilabial stop. These can both be regarded as separate phonemes in English, /t/ and /p/. We follow the convention of using slash or angle brackets for the phonemes. An allophone as a surface realisation of a phoneme in a particular (specifiable) context. So we see that 'cat' may be realised as a voiceless alveolar stop as in [k^hat^h] (transcribed now in square brackets to indicate that it is a surface phonetic form) in a context like 'cat hair', but it may appear as a glottal stop as in [k^haʔ] in a context like 'cat basket'. The glottal stop has no phonemic status in English: it is always an allophone of a phoneme (usually /t/) which appears in specifiable phonological (or maybe even social) contexts. Some phonemes show very little contextual variation, e.g. /s/. The realisation of the phoneme is referred to as a phone to indicate that it is the phonetic level to which we are referring.

The phoneme is not really the minimal unit of contrast as phonemes can themselves be decomposed into smaller distinctive features or articulatory gestures, and phonological theory can make use of these smaller elements to describe various changes, as we will see below. However, whatever the minimal unit, a level at which these units are organised into phoneme-size structures is present in the most common phonological theories.

By applying the technique of comparing possible lexical items in a language or dialect, we can build up a picture of how many contrastive units the language has. This is described as the phoneme inventory for a particular language or dialect. Describing how varieties of a language differ from each other requires a good understanding of the distinction between phoneme and the phonetic realisation of the phoneme. Some examples will make this distinction clearer if it is not already sufficiently clear.

For example, all varieties of English have a phoneme /r/ which derives from the same historical source and behaves in identical ways in different varieties where it occurs.

That is to say, all varieties of English can contrast the following words: /rap/ 'rap, wrap,' /lap/ 'lap, Lapp', /jap/ 'yap' and /nap/ 'nap'. However, the /r/ phoneme may be realised in very different ways in different varieties:

/rap/					
/r/ realised as....					
Alveolar approximant	Retroflex approximant	Tap	'Labiodental' approximant	Uvular trill	Trill
[ɹ]	[ɻ]	[ɾ]	[ʋ]	[ʀ]	[r]
[ɹap]	[ɻap]	[ɾap]	[ʋap]	[ʀap]	[rap]
SSBE	GenAm	Scottish/Welsh	SSBE	Northumbrian	Scottish/Welsh

These different phonetic realisations obviously have the effect of making the different varieties sound quite different, but in all cases the same phoneme is involved. The varieties differ at the phonetic level, but, in this respect at least, there is no deeper structural or phonological difference between them.

Other cases are not hard to find.

Australian English realises /i:/ as in SSBE 'fleece' as a diphthong which we might transcribe [əi] as in [fləis].

In SSBE the vowels /a/ as in 'trap' and /ɑ:/ as in 'father' are traditionally distinguished in terms of both quantity (duration) and quality – in 'trap' we have a short low front vowel [a] and in 'father' we have a long low back vowel [ɑ:]. In phonological terms, we would be inclined to state only one aspect of the contrast – quality or quantity – and derive the other from it. This may be problematic now for SSBE (see below). Some varieties of northern English and Australian English realise the vowels /a/ as in 'trap' and /ɑ:/ as in 'father' as almost identical in quality, perhaps relying solely on the length difference to indicate which is which: [tɹap] and [fɑ:ðə]. So there is again a phonetic difference, but not one which has any profound phonological significance.

Note: this is not the same as the difference in lexical distribution of /a/ in northern English, which is discussed below.

Indian English is often described as realising the voiceless (inter)dental fricative /θ/ as in 'thin' /θɪn/ as a voiceless dental plosive [t̪] as in [t̪ɪn] 'thin'. The voiceless alveolar plosive /t/ is realised as a voiceless retroflex plosive [ɖ] as in [ɖɪn] 'tin'. These differences may be fairly hard for speakers of other varieties of English to detect. Nevertheless, the contrast has been maintained, but in a different phonetic way:

SSBE		Indian English	
/t/ as in 'tin'	/θ/ as in 'thin'	/t/ as in 'tin'	/θ/ as in 'thin'
[t ^h ɪn]	[θɪn]	[t ^h ɪn]	[t̪ɪn]

Because the phonemic level is abstract, and in order to make comparisons easier, we can use the same phonemic symbols for both SSBE and Indian English even though the phonetic realisations are different.

A similar pattern of realisations for /t/ and /θ/ is seen in some varieties of Irish English, where /θ/ is dental [t̪] and /t/ is alveolar [t]. This contrast is often difficult to hear, as most speakers of other varieties of English are used to considering dental and alveolar plosives as realisations of the same phoneme /t/. This may occasionally lead to a misreporting that Irish English has lost one phoneme and merged the contrast, though this is true for some varieties. It is important to be extra cautious when analysing different varieties of one's own native language as the tendency to interpret other varieties' contrasts in terms of the contrasts in your own native variety is hard to guard against.

So far we have seen that different varieties of English may vary in the way that the same underlying contrasts are realised phonetically.

However, as indicated in the example of the Irish English case above, varieties can also differ in the number of contrasts they have, and in the lexical distribution of those contrasts.

Some varieties of Irish English are reported to have 'lost' the /θ/ phoneme, merging it with /t/. A similar change affecting the same phoneme is in evidence in the speech of younger speakers of varieties of British English, but here /θ/ merges with /f/:

Some Irish English		Some SSBE	
'tin'	'thin'	'fin'	'thin'
[t ^h ɪn]	[t ^h ɪn]	[fɪn]	[fɪn]

In these cases, the varieties in question have lost phonemes.

A more famous example of a difference in the number of phonemes in different varieties of English comes from northern English versus SSBE:

SSBE		Northern English
/ʊ/	/ʌ/	/ʊ/
'push'	'bun'	'push' 'pull'
'pull'	'run'	'bull' 'bun'
'bull'	'cup'	'run' 'cup'

Northern varieties of British English lack the phoneme /ʌ/ entirely.

Finally, some varieties of English (Scottish, Irish, North American, Australian, New Zealand) have a contrast /w/ ~ /ɹ/. The symbol /ɹ/ refers to a voiceless labio-velar approximant – a voiceless 'w', written 'wh', e.g.

SSBE	Scottish English	
/w/	/w/	/ɹ/
'white' vs. 'wide'	'wide'	'white'
'weal' vs. 'wheel'	'weal'	'wheel'
'wisp' vs. 'whisper'	'wisp'	'whisper'

Some differences are not due to a difference in the phoneme inventory, but due to a difference in the lexical distribution of phonemes. This is seen, for example, in the distribution of /ɑ:/ in northern accents of British English. Northern varieties of British English (NBE) do have a contrast between long and short low vowels (as described above, it may be more a quantitative contrast than a qualitative one) but words in SSBE which have /ɑ:/ like 'bath', 'castle', 'fast' have /a/ in NBE.

	NBE	SSBE
'bath'	/a/	/ɑ:/
'castle'	/a/	/ɑ:/
'bar'	/ɑ:/	/ɑ:/
'card'	/ɑ:/	/ɑ:/
'trap'	/a/	/a/
'cat'	/a/	/a/

Other examples of this are more sporadic, e.g. SSBE 'lever' with /i:/ but /ɛ/ in North America. Despite the difference for 'lever', SSBE and NAmE both have /i:/ in 'fever' and /ɛ/ in 'clever'.

Once we have investigated all the different contrasts in SSBE, we can draw up a list of phonemes – the phoneme inventory.

It is not unusual to display the symbols for the vowel and consonant phonemes separately. The consonant phonemes are classified in terms of place of articulation (where produced), manner of articulation (how produced), and whether the consonant is voiced or voiceless. The vowels may be arranged in a vowel quadrilateral, as shown below. It used to be thought that the relative positions

of the vowels were due to articulation and tongue height, but it is now known that this is false. The vowel quadrilateral describes a vowel space in which vowels can be oriented relative to one another.

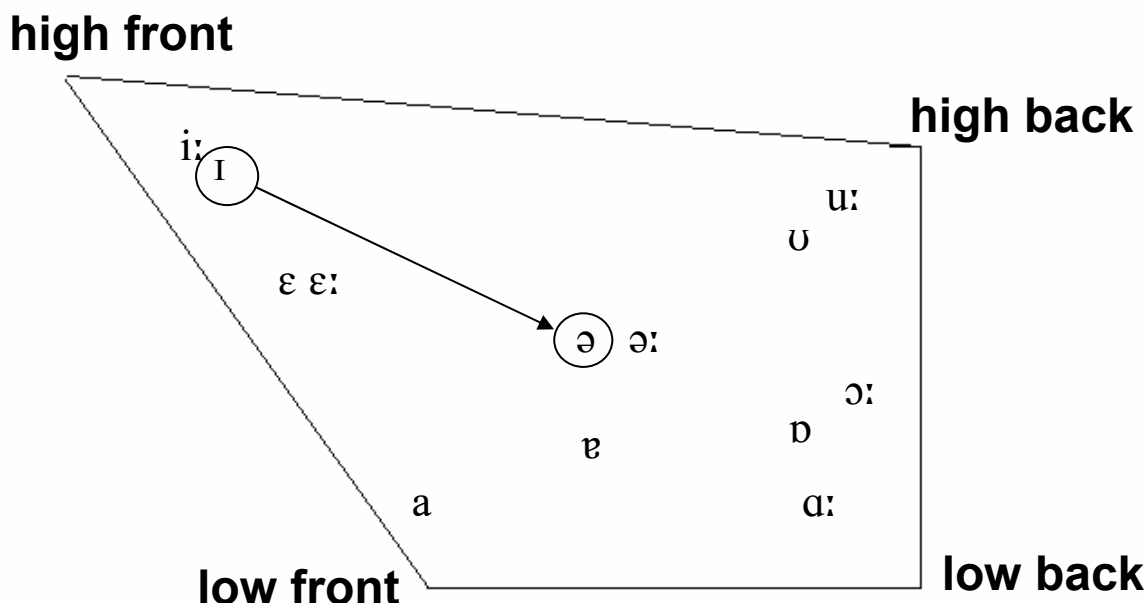


Figure 1: A vowel quadrilateral showing the distribution of some SSBE vowels. The circles surround the vowels which function independently and as the start points or end points (direction shown by the arrow) of the centring diphthong /ɪə/ as in NEAR /nɪə/.

Figure 1 shows the distribution of some SSBE monophthongal vowels in a vowel quadrilateral. Diphthongs are shown with both their start and end points marked, an arrow linking them, as illustrated for the centring diphthong /ɪə/ as in NEAR. Note that both /ɪ/ and /ə/ also function independently as vowels in KIT and commA respectively.

Notice that the vowels form pairs, e.g. /i:/ as in 'bead' versus /ɪ/ as in 'bid'; /u:/ as in 'fool' versus /ʊ/ as in 'full'. These vowel pairs are traditionally referred to as tense-lax pairs, with the tense member of each pair (/i:/ and /u:/) being usually more peripheral in the vowel space in terms of quality and longer than the lax member in terms of quantity.

tense	lax
i: as in 'fleece'	ɪ as in 'kit'
u: as in 'goose'	ʊ as in 'foot'
ɔ: as in 'saw'	ɒ as in 'cloth'
ɑ: as in 'father'	a as in 'trap'

As phonology seeks to reduce redundancy in descriptions, it is possibly desirable to describe these oppositions in terms either of quality (/i:/ versus /ɪ/) or in terms of quantity (/i:/ versus /i/). A more detailed discussion occurs in Giegerich (1992: 70-71). A close approximation to surface realisations will be maintained here and both quantity and quality will be transcribed. As discussed below in the section on the contemporary realisation of centring diphthongs in SSBE, it can be argued that the SSBE system no longer has a straightforward tense-lax pairing, and both quantity and quality need to be transcribed.

Another way accents may differ from one another is in terms of a distribution of phonemes in different phonological environments.

The most striking difference between certain varieties of English is the presence or absence of the phoneme /r/, however it is realised phonetically, in syllable-final position. The details of syllable construction and syllable-based processes will be discussed next week. For the moment, it is sufficient to note that so-called non-rhotic accents of English (SSBE, many accents in northern England, some accents in the Caribbean, some accents in the eastern US, South African English, Australian and New Zealand English) have no /r/ in word-final and post-vocalic preconsonantal positions. Other varieties in North America, the west of England, Wales, Scotland and Ireland, and some parts of the Caribbean are rhotic. For example:

	rhotic	non-rhotic
'bar'	bar	bɑ:
'card'	kɑ:d	kɑ:d
'farther'	fɑ:ðə	fɑ:ðə
'read' (initial)		ri:d
'street' (initial cluster)		stri:t
'carry' (intervocalic)		kari:

The above transcriptions are broad phonemic designed to show the occurrence of /r/ only. Details of the phonetics of /r/ quality and the vowels etc. have been omitted.

It should be apparent that the orthographic form of the word retains an 'r', and this reflects its historical presence there. The non-rhotic varieties have undergone a sound change to 'lose' the /r/ in syllable-final position.

But this /r/ has not simply been deleted without consequence. It has had an effect on the vowels it 'left behind', as is illustrated in the following table:

examples	rhotic	Non-rhotic
here	/ɪr/	/ɪə/
hair	/eɪr/	/eə/
sure	/ʊr/	/ʊə/
car	/ɑr/	/ɑ:/
sport	/ɔr/	/ɔ:/
short	/ɔr/	
word	/əɪr/	/ə:/
bird		
heard		

The consequences of /r/ 'loss' are varied depending on the vowel involved. We see that a long vowel remains in some cases ('car', 'sport', 'short') and a diphthong in other cases. A diphthong is single phoneme consisting of two separate vowel qualities. The diphthongs ending in the so-called 'neutral' vowel schwa /ə/ are often referred to as centring diphthongs. The long vowel in 'word', 'bird', 'heard' is often transcribed using the symbol /ɜ:/, although this usage is not universal. I transcribe this vowel as a long schwa /ə:/, although it is not a diphthong, we could interpret this vowel as being a case of two successive schwas, i.e. /əə/, so it would not fit neatly into either group. In fact, as is discussed below, the situation is different for many if not all speakers of SSBE. The fact that we observe two different consequences of /r/ 'loss' – vowel lengthening versus centring diphthongs, is interesting to phonologists and phoneticians as ideally we would like to see a single outcome of a single process, but we will not go into any more detail here.

However, the situation is not so straightforward (of course...). Although speakers of a non-rhotic accent like SSBE will say 'hear loud noise' with 'hear' as /hɪə/, they will also say 'hear a loud noise' with [hɪər] before 'a' and 'hearing' as [hɪərɪŋ]. In other words, in these contexts, where a vowel follows, the /r/ occurs phonetically. Having defined the loss of /r/ as due to its occurrence in syllable-final position, we might analyse the /r/ as being heard when it is in non-syllable-final position. As we will see next week, when a vowel follows a consonant, we expect the consonant to form the onset of the following syllable. We have already seen that an /r/ between two vowels is retained within a word, e.g. 'carry' /kəri:/ [k^hɑ:ɪ:] and 'berry' /beri:/ [bɛɪɪ:] and one explanation for this is that the /r/ in each case forms the onset of the second syllable.

So when the words with underlying final /r/ appear before a vowel-initial word, the /r/ reappears as 'linking r'. Other words, which did not have /r/ historically may also show this effect. For example, 'law' [lɔ:], 'shah' [ʃɑ:], 'India' [ɪndɪə] all appear as such before consonants as in 'law degree' and 'India Dock', but before vowels a phonetic [ɹ] appears: 'law enforcement' [lɔ:ɹɛŋfɔ:smənt] and 'India and Pakistan' [ɪndɪəɹəmpakɪstɑ:n]. Here again we can posit an underlying /r/ which fails to surface in syllable-final position. In this case of a non-historical /r/, phonologists speak of 'intrusive /r/'. The vowels affected by intrusive /r/ are precisely those which show historically-motivated linking /r/.

Once again we see the utility of distinguishing between a surface phonetic level and a more abstract level if we wish to unite both forms with a single underlying representation, maximising processing and minimising storage. The fact that speakers have generalised to lexical items which fit a particular phonological shape but did not have underlying /r/ historically can be argued to indicate the reality of the processual element in this case.

It would be nice to generalise and to state that resyllabification of underlying segments happens in all cases, or that a principle of resyllabification can explain a wider range of sound patterns, like, for example, the case of final /g/ in words like [strɒŋgə] /strɒŋgə/ derived from /strɒŋg/. However, notice that cases like 'wrong about' or 'strong-arm tactics' or 'young adults' all have surface forms lacking /g/ in SSBE.

The system above with the centring diphthongs is that of conservative Received Pronunciation. Forms of SSBE spoken by most people today have lost the centring diphthongs to give long vowels: /ɪə/ > /i:/, /eə/ > /ɛ:/, /ʊə/ > /ɔ:/ or /u:/. The changes for /eə/ and /ʊə/ are generally recognised. A consequence of this is that the loss of /r/ in some contexts has the uniform consequence of making vowels long. Also, the surface SSBE vowel system has long and short /ɪ/ ('bid' and 'beard') versus a long /i:/ ('bead'). Before the 'smoothing' of the centring diphthongs /ɪə/ and /ʊə/, a length-quality contrast was recognised for forms of standard British English: short /ɪ/ ('bid') versus a long /i:/ ('bead'). It remains to be seen whether this change has any further structural repercussions.

Reading

Giegerich, Heinz. (1992). *English phonology*. CUP, Cambridge
Wells, John C. (1982). *Accents of English*. 3 volumes. CUP, Cambridge
McMahon, April M. (2002). *An Introduction to English Phonology*. Edinburgh University Press, Edinburgh.