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Describing English Consonants

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Introduction

In fact, each IPA symbol is shorthand for a whole range of properties, and those properties explain how the particular segment being symbolised is pronounced; unpacking the black box for each sound reveals not a jumble, but an internal structure, and understanding that structure allows us to make comparisons with

other sounds. When we know that [k], for instance, is a voiceless velar plosive, we can start to see what properties it shares with other sounds which might also be voiceless, or velar, or plosives; we can also see how it differs from other sounds which are not voiceless, or velar, or plosives. Furthermore, we shall see what properties different allophones of the same phoneme share, which might allow them to be regarded as 'the same' by speakers of English: that is, we can work out what particular phonetic features speakers of English tend to ignore, and which they are aware of. Since this may be very different for speakers of other languages, unpacking IPA notation in this way also allows cross-linguistic comparisons to be made.

The Anatomy of a consonant

What is the Airstream Mechanism?

Speech is audible because the movements of articulators cause the air to vibrate, forming sound waves which travel to the hearer's ears, and set up vibrations in her inner ear, which are then translated into sounds again by the brain. Since sound waves need air, it follows that articulatory vibrations will only make sound waves if there is a moving body of air available. Airstreams can be set in motion, or initiated, in three ways; however, only one is used in English, and indeed is found in every language of the world. Essentially, speaking is modified breathing: it makes use of the resources involved in normal respiration, but in a more controlled way. When we are simply breathing quietly, the phases of breathing in and out last approximately the same time, and expiration is not under our physical control; it simply occurs as an automatic consequence of having breathed in. However, when we are speaking, the phase of breathing out is significantly longer, depending on

the length of the utterance we want to produce. A network of muscles, like the intercostal muscles between our ribs, come into play to make breathing out smoother, more gradual and more controlled during speech, providing a regular flow of air which can then be modified by the articulators in various ways. All the sounds of English, both consonants and vowels, are produced on this pulmonic egressive airstream, where the initiator is the lungs and the rest of the respiratory system, and the direction of airflow is outwards: this is overwhelmingly the most common airstream mechanism in every language of the world. It can generally be taken for granted that the sounds under discussion below are pulmonic egressive, but you should remember to give that information in a complete description: so the labial nasal [m] (which, as we shall see, is produced using the lips – hence labial, and with airflow through the nose – hence nasal), is strictly a pulmonic egressive labial nasal.

It is possible to produce speech using a pulmonic ingressive airstream. No language seems to use this airstream regularly for particular sounds, although it has been reported in various cultures as a means of voice disguise: if you try to breathe in and speak at the same time, you will find that the pitch of your voice raises significantly. There are two other airstreams which may be involved in speech, although even in languages where these are used, they will characterise only a few sounds, interpolated in a stream of pulmonic egressive speech. The first is the glottalic airstream mechanism, initiated by a movement of the larynx, which is where you can feel your ‘Adam’s apple’ protruding slightly about half-way up your throat. The larynx can move up or down, and the glottalic airstream can therefore be either ingressive or egressive, producing sounds known as implosives and ejectives respectively; none of these occur in English. Finally, the ‘tut-tut’ click sound [] is produced on a velaric airstream, which operates only ingressively.

When you make [] you can feel that the back of your tongue is pressed against the roof of your mouth, stopping air from moving any further back; a little air is then drawn into the mouth further forward, and the closure with the tongue is released to make a click. Neither the glottalic nor the velaric airstreams provide airflow with the volume or controllability of the pulmonic system.

Voiced or voiceless?

A major division among speech sounds which is relevant for all languages is the dichotomy of voiced and voiceless. If you put your fingers on your 'Adam's apple' or 'voicebox' (technically the larynx), and produce a very long [zzzzzzz], you should feel vibration; this shows that [z] is a voiced sound. On the other hand, if you make a very long [sssssss], you will not feel the same sort of activity: [s] is a voiceless sound. Pulmonic egressive air flows through the trachea, or windpipe, and up into the larynx, which is like a mobile little box suspended at the top of the trachea, acting to control the airway to and from the lungs, with the epiglottis above it protecting the lungs by stopping foreign bodies like food from dropping in. Stretched across the larynx from front to back are the vocal folds, or vocal cords. These can be pulled back and drawn apart, in which case they leave a free space, the glottis, through which air can flow: this is the case for voiceless sounds like [s]. For voiced sounds, the vocal folds are drawn together, closing off the glottis; however, the pressure of air flowing from the lungs will cause the folds to part, and their essentially elastic nature will then force them together again. Repetitions of this cycle of opening and closing cause vibration, as for [z]. The number of cycles of opening and closing per second will depend on the size of the vocal folds, and determines the pitch of the voice: hence, children's smaller, shorter vocal folds produce their higher voices. Although sounds can be voiced in any position in the word, voicing is most obvious medially, between other voiced

sounds: when there is an adjacent voiceless sound or pause, voicing will not last for so long or be so strong. Consequently, although English has the minimal pairs tip – dip, latter – ladder, bit – bid for /t/ versus /d/, [d] is only voiced throughout its production in ladder, where it is medial and surrounded by voiced vowels. Word-initially, we are more likely to identify /t/ in tip by its aspiration, and /d/ in dip by lack of aspiration, than rely on voicing. Voicelessness and voicing are the two main settings of phonation, or states of the glottis: for English at least, the only other relevant case, and again one which is used paralinguistically, is whisper. In whisper phonation, the vocal folds are close together but not closed; the reduced size of the glottis allows air to pass, but with some turbulence which is heard as the characteristic hiss of whisper.

Oral or nasal?

The next major issue is where the pulmonic egressive airstream used in English goes. For most sounds, air passes from the lungs, up through a long tube composed of the trachea, or windpipe; the larynx; and the pharynx, which opens out into the back of the oral cavity. The air passes the various articulators in the mouth, and exits at the lips; and all these vocal organs are shown in Figure 3.1. However, for three English sounds, air passes through the nasal cavity instead. The key to whether air can flow through the nose is the velum, or soft palate, which you can identify by curling the tip of your tongue up and running it back along the roof of your mouth until you feel the hard, bony palate giving way to something squashier. For oral sounds, the velum is raised and pushed against the back wall of the pharynx, cutting off access to the nose. However, for [m], [n] and [ŋ] in ram, ran and rang, the velum is lowered, so that air moving up from the lungs must flow through the nose. If you produce a long [s], you will be able to feel that air is passing only through your mouth; conversely, if you hum a long [m], you will

notice that air continues to flow through your nose while your lips are pressed together, with that closure being released only at the end of the [m]. When someone suffering from a cold tells you ‘I’ve got a cold id by dose’ instead of ‘I’ve got a cold in my nose’, she is failing to produce [n] and [m] because soft tissue swelling blocks air access to the nose and perforce makes all sounds temporarily oral. Nasal sounds, like [m] and [n], are produced with air only passing through the nasal cavity for at least part of their production. On the other hand, nasalised sounds, like the vowel in can, preceding a nasal consonant, as opposed to the vowel in cat, which precedes an oral one, are characterised by airflow through both nose and mouth simultaneously.

What is the manner of articulation?

To produce any consonant, an active articulator, usually located somewhere along the base of the vocal tract, moves towards a passive articulator, somewhere along the top. Where those articulators are, determines the consonant’s place of articulation, as we shall see in the next section. How close the active and passive articulators get, determines the manner of articulation. There are three main manners of articulation, and one subsidiary case which in a sense is intermediate between the first two. **A. STOPS** If the active and passive articulators actually touch, stopping airflow through the oral cavity.

completely for a brief period, the sound articulated is a stop. If you put your lips together to produce [p] pea, and hold them in that position, you will feel the build-up of air which is then released when you move from the stop to the following vowel. Further back in the vocal tract, [t] tea and [k] key are also stop sounds. More accurately, all these are plosives, the term for oral stops produced on a pulmonic egressive airstream, just as clicks are stops produced on a velaric

ingressive airstream, for instance. Plosives may be voiceless, like [p], [t] and [k], or voiced, like their equivalents [b], [d] and [ ]. Since the definition of a stop involves the complete, transient obstruction of the oral cavity, it also includes nasal sounds, where airflow continues through the nose. English [m], [n] and [ŋ] are therefore nasal stops, although they are typically referred to simply as nasals, as there are no distinctive English nasals involving other manners of articulation. All these nasals are also voiced. Finally, some varieties of English also have subtypes of stops known as taps or trills. While a plosive is characterised by a complete obstruction of oral airflow, followed generally by release of that airflow, a tap is a very quick, ballistic movement where the active articulator strikes a glancing blow against the passive one; interruption of the airstream is real, but extremely brief. Many Scots speakers have a tapped allophone [ɾ] of the phoneme /r/ between vowels, as in arrow, very; many American speakers have a similar tap as a realisation of /t/ in butter, water. Trills are repeated taps, where the active articulator vibrates against the passive one. Trilled [r] is now rather uncommon for speakers of English, although attempts at imitating Scots often involve furious rolling of [r]s.

B. FRICATIVES

During the production of a fricative, the active and passive articulators are brought close together, but not near enough to totally block the oral cavity. This close approximation of the articulators means the air coming from the lungs has to squeeze through a narrow gap at high speed, creating turbulence, or local audible friction, which is heard as hissing for a voiceless fricative, and buzzing for a voiced one. English [f] five and [s] size are voiceless fricatives, while [v] five and [z] size are voiced. The subclass of affricates consists of sounds which start as stops and end up as fricatives; but as we shall see in Chapter 5, they behave as

single, complex sounds rather than sequences. Stops generally involve quick release of their complete articulatory closure; but if this release is slow, or delayed, the articulators will pass through a stage of close approximation appropriate for a fricative. The two relevant sounds for English are [tʃ], at the beginning and end of church, and its voiced equivalent [d], found at the beginning and end of judge. If you pronounce these words extremely slowly, you should be able to identify the stop and fricative phases.

C. APPROXIMANTS

It is relatively easy to recognise a stop or fricative, and to diagnose the articulators involved, since these are either touching or so close that their location can be felt. In approximants, on the other hand, the active and passive articulator never become sufficiently close to create audible friction. Instead, the open approximation of the articulators alters the shape of the oral cavity, and leads to the production of a particular sound quality. There are four approximant consonant phonemes in English: /j/ yes, /w/ wet, /r/ red (although as we have seen, /r/ may have a tapped allophone for some speakers) and /l/ let. All these approximants are voiced.

What is the place of articulation?

The location of the active and passive articulators determines the place of articulation for a consonant. In English, consonants are produced at eight places of articulation. Since we have now covered all the other articulatory parameters required to describe consonants, introducing and defining these places will allow us to build up a complete consonant phoneme system for English.

A. BILABIAL

For a bilabial sound, the active articulator is the bottom lip, and the passive articulator is the top lip. /p/ pie voiceless bilabial plosive /b/ by voiced bilabial plosive /m/ my voiced bilabial nasal There is at least one further English phoneme which to an extent fits under this heading: this is the approximant /w/ in wet. In producing [w], the lips are certainly approximated, though not enough to cause friction or obstruct the airflow; but you should be able to feel that the back of your tongue is also bunched up. This additional articulation takes place at the velum, so that [w] is not simply a labial sound, but a labial-velar one. In some accents of English, notably those spoken in Scotland and New Zealand, this /w/ contrasts with //, the voiceless labial-velar fricative, which tends to occur in words spelled . If you have the same pronunciation for witch and which, or Wales and whales, then you have only /w/; if these are consistently different for you, then these minimal pairs establish a contrast of /w/ and //.

/w/ witch voiced labial-velar approximant

/ʍ/ which voiceless labial-velar fricative

B. LABIO-DENTAL

For labio-dental sounds, the active articulator is again the bottom lip, but this time it moves up to the top front teeth. Note that these sounds are labio-dental, while /w/ and // are labial-velar, because in the first case, articulation takes place only at a single location, while in the second, there are two separate, simultaneous articulations.

/f/ fat voiceless labio-dental fricative

/v/ vat voiced labio-dental fricative

C. DENTAL

In most English sounds, and most speech sounds in general, the active articulator is part of the tongue; to avoid confusion, places of articulation where the tongue is involved are therefore generally called after the passive articulator. For the two dental fricatives, it follows that the passive articulator is the top front teeth; the active articulator is the tip of the tongue. The tongue itself is conventionally divided into the tip (the very front); the blade (just behind the blade, and lying opposite the alveolar ridge); the front (just behind the blade, and lying opposite the hard palate); the back (behind the front, and lying opposite the velum); and the root (right at the base, lying opposite the wall of the pharynx).

[θ] thigh voiceless dental fricative

[ð] thy voiced dental fricative

D. ALVEOLAR

Alveolar sounds are produced by the tip or blade of the tongue moving up towards the alveolar ridge, the bony protrusion you can feel if you curl your tongue back just behind your top front teeth.

/t/ tie voiceless alveolar plosive

/d/ die voiced alveolar plosive

/n/ nigh voiced alveolar nasal

/s/ sip voiceless alveolar fricative

/z/ zip voiced alveolar fricative

/r/ rip voiced alveolar central approximant

/l/ lip voiced alveolar lateral approximant

The symbol /r/ is used for the phoneme here and throughout the book, primarily because it is typographically convenient; but different realisations

of /r/ are found throughout the English-speaking world, and as we have seen, [r] itself, the voiced alveolar trill, is rather rare. The tapped realisation, [ɾ], is also alveolar; but another even more common pronunciation is not. This is the voiced retroflex approximant, [ɹ], which is produced with the tip of the tongue curled back slightly behind the alveolar ridge; this is the most common realisation of /r/ for speakers of Southern Standard British English and General American.

E. POSTALVEOLAR

If you move your tongue tip back behind the alveolar ridge, you will feel the hard palate, which then, moving further back again, becomes the soft palate, or velum. Postalveolar sounds are produced with the blade of the tongue as the active articulator, and the adjoining parts of the alveolar ridge and the hard palate as the passive one. They include two fricatives, and the affricates introduced in the last section.

/ʃ/ ship voiceless postalveolar fricative

/ʒ/ beige voiced postalveolar fricative

/tʃ/ chunk voiceless postalveolar affricate

/dʒ/ junk voiced postalveolar affricate

F. PALATAL

Palatals are produced by the front of the tongue, which moves up towards the hard palate. We have so far encountered two palatal sounds: the approximant /j/ in yes, and the voiceless palatal stop [c] in kitchen. Recall, however, that [c] is the allophone of /k/ found before certain vowels; velar [k] appears elsewhere. There is a similar pattern for /g/, which has as allophones velar [ ] in garden and palatal [] give. Since we are constructing a phoneme system here, these allophones are not included in the list. /j/ yes voiced palatal approximant

G. VELAR

For velar sounds, the active articulator is the back of the tongue, and the passive articulator is the velum, or soft palate. The labial-velar approximant and fricative /w/ and // are not included here, as they were discussed above with the bilabials; however, it should be remembered that these doubly-articulated sounds strictly belong under both headings. Similarly, although the 'dark l' realisation, [ ], is also velar, it does not appear in the list below as it is an allophone of /l/.

There is a further accent difference involving velar sounds: in some varieties of English, notably Scottish ones, there is a voiceless velar fricative
, /x/: this is the sound at the end of Scots loch, which speakers of other accents typically replace with a [k].

/k/ cot voiceless velar plosive /g / got voiced velar plosive

/ŋ/ rang voiced velar nasal /x/ loch voiceless velar fricative

H. GLOTTAL

Glottal sounds are in the minority in articulatory terms, since they do not involve the tongue: instead, the articulators are the vocal folds, which constitute a place of articulation as well as having a crucial role in voicing. English has two glottal sounds. The first is allophonic, namely the glottal stop, [ʔ], which appears as an intervocalic realisation of /t/ in many accents, as in butter. The glottal stop is technically voiceless, though in fact it could hardly be anything else, since when the vocal folds are pressed together to completely obstruct the airstream, as must be the case for a stop sound, air cannot simultaneously be passing through to cause vibration. The second, the voiceless glottal fricative [h], is a phoneme in its own right. /h/ high voiceless glottal fricative.