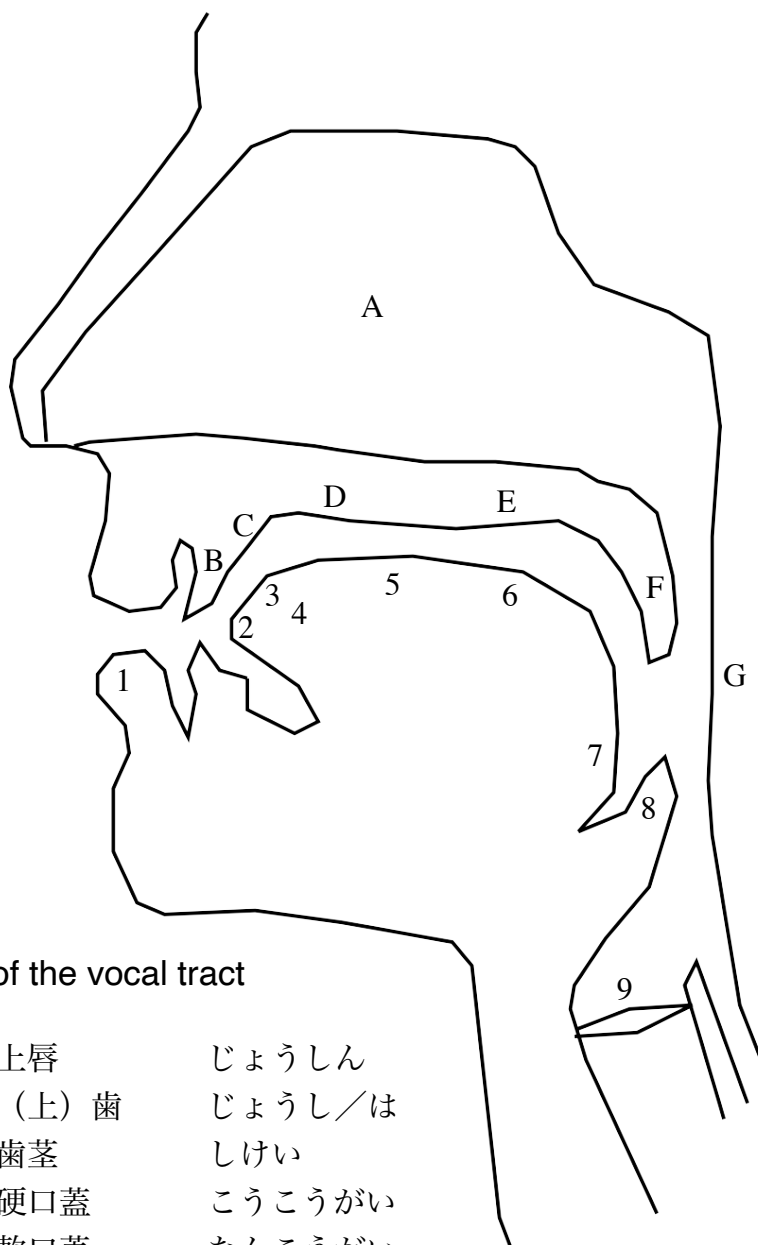


Phonology

P. Spaelti

The Vocal Tract



Parts of the upper surface of the vocal tract (passive articulators)

(A) upper lip	上唇	じょうしん
(B) (upper) teeth	(上) 歯	じょうし／は
(C) alveolar ridge	歯茎	しけい
(D) hard palate	硬口蓋	こうこうがい
(E) soft palate / velum	軟口蓋	なんこうがい
(F) uvula	口蓋垂	こうがいすい
(G) pharynx wall	咽頭壁	いんとうへき

Articulators

(1) lower lip	下唇	かしん
(2) tongue tip	舌尖	ぜっせん
(3) blade	舌端	ぜったん
(4) front	前舌面	ぜんぜつめん
(5) center	中舌面	ちゅうぜつめん
(6) back	後舌面	こうぜつめん
(7) root	舌根	ぜっこん
(8) epiglottis	喉頭蓋	こうとうがい
(9) vocal folds	声帯	せいたい

The Consonants of English

Airstream mechanism (気流機構)

All consonants in English (and Japanese) are made with an airstream coming from the lungs. Such an airstream is called **PULMONIC EGRESSIVE** (肺臓呼気流)

pulmonic = produced by the lungs

egressive (流出) = flowing out from. The opposite is ingressive (流入)

Glottal State (声門の状態)

Consonants in English can be classified as either **VOICED** (有声) or **VOICELESS** (無声)

English voiceless stops are generally **ASPIRATED** (帯気) when they appear at the beginning of a stressed syllable.

Place of articulation (PoA) (調音位置)

The place of articulation of a consonant is the answer to the question ‘where in the mouth is the consonant formed?’

Labial (唇音)

Sounds made using the lips are called labial. This can be done in two ways. One possibility is to bring both lips together. This type of sound is called **BILABIAL** (両唇音). Examples of bilabial sounds are the sounds at the beginning of the words ‘**p**an’, ‘**b**an’, and ‘**m**an’. The second possibility is to bring the lower lip to meet the teeth. This type of sound is called **LABIODENTAL** (唇齒音). The first sound in the words ‘**f**ast’ and ‘**v**ast’ are labiodental.

Coronal (舌頂音)

Sounds made with the front part of the tongue are called coronal. The front part of the tongue is very movable, and there are many possibilities. The most important for English are **DENTAL** (齒音), **ALVEOLAR** (齒莖音), and **PALATO-ALVEOLAR** (口蓋齒莖音).

Dental sounds are made by putting the tongue tip against the teeth. The initial sounds in ‘**t**heme’ and ‘**t**his’ are dental.

Alveolar sounds are made by putting the tongue tip against the alveolar ridge. The first sounds in the words ‘**t**ip’, ‘**d**ip’, ‘**n**ip’, ‘**s**ip’, ‘**z**ip’, and ‘**l**ip’ are alveolar for most speakers.

In the case of palato-alveolar sounds, the tongue tip makes contact with the area behind the alveolar ridge and the hard palate. The first sound in words like ‘**sh**in’, ‘**ch**in’ and ‘**g**in’ are palato-alveolar.

Dorsal (舌背音)

Sounds made with the back of the tongue are called dorsal. In the most common type of dorsal sound, the tongue back touches the soft palate—the velum, and such sounds are called **VELAR** (軟口蓋音). Velar sounds occurring in English are the initial sounds in ‘**c**oat’ and ‘**g**oat’, and the final sound in the word ‘**r**ing’.

It is possible for the tongue back to make contact with the roof of the mouth even further back, by touching the uvula. Such sounds are called **UVULAR** (口蓋垂音). They do not occur in English or Japanese, but the ‘r’ of French is a uvular sound.

Other places of articulation

Another possible way to produce a sound is by raising the center of the tongue towards the palate. Such sounds are called **PALATAL** (口蓋音). An example of a palatal sound in English is the initial sound of the word ‘you’. Palatal sounds are halfway between coronal and dorsal sounds, and they share some of the properties of both.

The initial sound of the word ‘we’ is made by narrowing the oral tract at both the lips and the velum. This type of sound is called **LABIO-VELAR** (), since it involves both a labial and a velar articulation.

Finally it is also possible to use the larynx to produce a consonant. Sounds made by narrowing the glottis are called **GLOTTAL** (声門音). The initial sound of the word ‘head’ is glottal. It is also possible to stop airflow completely using the larynx. This is what English speakers do between the two vowels of the expression ‘uh-oh’, and such a sound is called a **GLOTTAL STOP** (声門閉鎖音). Aside from such special uses, the glottal stop is not used as a speech sound in English, though it is in many other languages.

Manner of Articulation (調音様式)

The manner of articulation of a consonant is the answer to the question ‘how is the the consonant formed?’ There are 3 parts to this answer.

Nasal/Oral

Depending on whether the velum (軟口蓋) is lowered or raised air may flow through the nose.

If the velum is lowered, the passage between the oral cavity (口腔) and the nasal cavity (鼻腔) is open and air can flow through both the nose and mouth. Sounds made in this manner are called **NASAL** (鼻音). Typical nasal consonants that occur in English, as well as Japanese, are the nasal stops [m, n, ŋ].

If the velum is raised, the passage between the oral cavity and the nasal cavity is blocked, and air can flow out only through the mouth. This type of sound is called **ORAL**. Except for the nasal stops [m, n, ŋ], all consonants of English are oral.

Lateral/Central

The tongue is very flexible. Depending on the shape of the tongue, air can be made to flow through the sides of the oral tract. A sound made in this manner is called **LATERAL** (側音). The only lateral sound of English is [l].

Sounds made with the air flowing through the center of the mouth are called **CENTRAL**. In English, all sounds other than [l] are central.

Stricture (狭め)

Consonants are made by narrowing the passage of air through the vocal tract. The narrowest point—the point of greatest constriction—defines the consonant. The names for the different types of constriction are:

Stop (閉鎖音)

a complete closure. No air is permitted to flow through.

Fricative (摩擦音)

a slight opening. The narrow passage causes a rubbing, or hissing sound.

Affricates (破擦音)

begin as a stop, but the stop is released as a fricative.

Approximant (接近音)

if the passage is even wider than for a fricative, the hissing noise disappears. We can distinguish two types of approximants: **LIQUIDS** (流音) and **GLIDES** (わたり音)

Liquids

are the ‘r’ and ‘l’ sounds. The ‘r’-sounds (also called **RHOTICS**) include many different types of sounds, including approximants, trills, and taps. The British English ‘r’ sound is an alveolar approximant [ɹ]. The American ‘r’ is often made by curling the tongue back. This tongue shape is called **RETROFLEX**, and the symbol used for this sound is [ɻ]. The Japanese ‘r’ is a tap [ɾ].

Glides

are very similar to vowels, and for this reason they are sometimes called **SEMI-VOWELS**. The palatal glide [j] is the consonant most similar to the vowel [i]. The labiovelar glide [w] is most similar to the vowel [u].

The Vowels of English

Vowels in English, as well as other languages, are described in terms of three basic factors:

Tongue height

Typically we can distinguish at least 3 tongue heights: **HIGH**, **MID** and **LOW**.

Examples of high vowels are [i], as in the word ‘cheese’, and [u], as in ‘food’. Mid vowels are [e], [ɛ], [o], and [ɔ]. The vowel [ɛ] occurs in words like ‘bed’, while [ɔ] occurs in the word ‘course’. Examples of low vowels are [æ], as in ‘hat’, or [ɑ], as in ‘hot’.

Further distinctions are sometimes made. Thus [e] and [o] are sometimes called **MID-HIGH**, while [ɛ] and [ɔ] are referred to as **MID-LOW**.

Front/back position of the tongue

Depending on whether the highest point of the tongue is in the front or the back of the mouth, we can distinguish **FRONT** and **BACK** vowels.

The vowels [i], [e], [ɛ] and [æ] are front, while the vowels [u], [o], [ɔ] and [ɑ] are back.

Vowels made with the highest tongue position in between these two extremes are called **CENTRAL**. For example the English vowel [ʌ], in words like ‘but’, is a central vowel.

Lip shape

Finally we can describe vowels according to the shape made by the lips. Vowels where the lips form a circular shape are called **ROUND**, while if the lips are stretched the vowel is called **UNROUND**.

In many languages (including English), high and mid back vowels are always round, while the front and low vowels are unround. The vowels [u], [o], and [ɔ] are round. The vowels [i], [e], [ɛ], [æ] and [ɑ] are unround.

However, it is also possible for front vowels to be round, and back vowels to be unround. For example the vowel in the French word *tu* ‘you’, or in German *Bücher* ‘books’—phonetic symbol [y]—is a high front round vowel. The vowel in Japanese *kuru* (来る) is a high back unround vowel, and the phonetic symbol for this vowel is [ɯ].

Besides these three factors, a fourth factor is needed to describe all the vowels of English.

Tense/lax vowels—ATR vs. RTR

A further distinction is that between the vowels [i] and [ɪ] in words like ‘seat’ vs. ‘sit’, or between [u] and [ʊ] as in the words ‘food’ vs. ‘good’. A similar distinction is also seen in the pairs [e] vs. [ɛ] (for example ‘late’ vs. ‘let’), and [o] vs. [ɔ] (for example ‘boat’ vs. ‘bought’). In each of these pairs the first vowel is produced with a slightly higher tongue position, than the second, but also the first vowel is slightly longer, than the second. The first vowel in each pair is often called **TENSE**, while the second is called **LAX**.

A very similar distinction is found in many languages of West Africa. In these languages the difference is made by moving the base, or root, of the tongue forward—for the ‘tense’ vowels—and moving the base of the tongue toward the pharynx wall—for ‘lax’ vowels. Vowels made with the base of the tongue moved forward are called **ADVANCED TONGUE ROOT** (or **ATR** for short). Vowels with the base of the tongue moved back are called **RETRACTED TONGUE ROOT** (or **RTR**).

It is still disputed whether the difference between tense and lax vowels in English, involves movement of the tongue root, or not. Nevertheless I will continue to use ATR and RTR to refer to tense and lax vowels respectively.

The consonants of English

	Labial	Coronal		Dorsal	
Stops	p b	t d		k g	
Affricates			tʃ dʒ		
Fricatives	f v	θ ð s z	ʃ ʒ		h
Nasals	m	n		ŋ	
Approximants	w	r		j	
Lateral approx.		l			

The voiceless fricative *h* sound which has no place of articulation is sometimes called *glottal*.

The labial fricatives of English are typically labiodental, while all other labials are bilabial.

The consonants of Japanese

	Labial	Coronal		Dorsal	
Stops	p b	t d		k g	
Affricates		ts tʃ	dʒ dʒ		
Fricatives	ɸ	s z	ʃ	ç	h
Nasals	m	n			
Approximants	w			j	
Flap		r			

The labial fricative of Japanese is typically bilabial, in contrast to English *f*.

Aside from these basic consonants, Japanese has a second type of consonant which adds a palatal *j*-like articulation to certain consonants. We can call such consonants *palatalized*.

	Labial	Coronal		Dorsal	
Stops	p ^j b ^j			k ^j g ^j	
Affricates					
Fricatives					
Nasals	m ^j	n ^j			
Approximants					
Flap		r ^j			

Finally Japanese allows many of its consonants to be pronounced long, typically the voiceless obstruents and the nasals: pp, tt, kk, ss, ʃʃ, mm, nn. Also pp^j, etc.

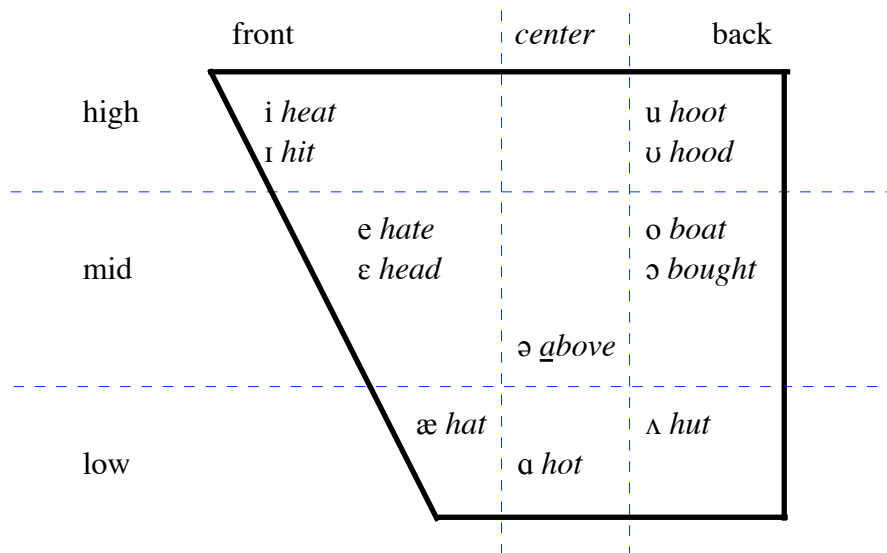
With long affricates the stop is made long: ttʃ, tʃʃ.

Long fricatives (apart from ss and ʃʃ) and long voiced obstruents are rare in Japanese.

The Vowels of English

The articulatory description given for consonants is not very useful for vowels. Instead we place the vowels in an *auditory space* defined by the vowel triangle 'i—a—u'.

Using a minimal pair test frame h____t we get:

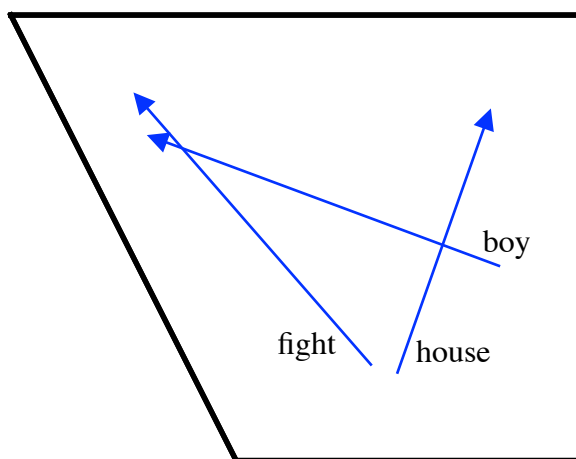


This is basically a 5 vowel system, like Japanese, but all vowels are double, and the low vowels are triple. However we also add the reduced vowel 'schwa'.

Thus we need some way to distinguish the pairs —> 'tense' vs. 'lax'

Note that this does not help much with the 3 low vowels

Diphthongs



True diphthongs vs. others