

Phonetics and Phonology

Lecture 5: Consonants (introduction)

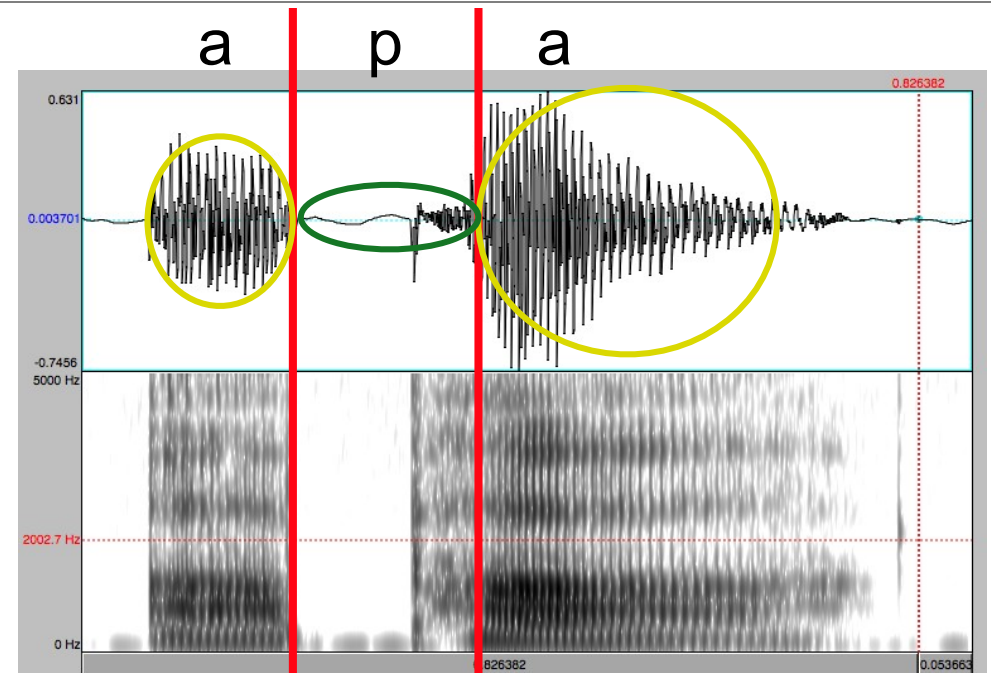
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takeki.kamiyama@univ-paris8.fr

Vowels and consonants? - **articulatory** characteristics

- **Vowel**: the airstream flows out (relatively) freely, without a major obstacle in the vocal tract. It is usually accompanied by voicing.
- **Consonant**: the airstream is blocked completely or incompletely at a given point in the vocal tract. Some consonants are accompanied by voicing.

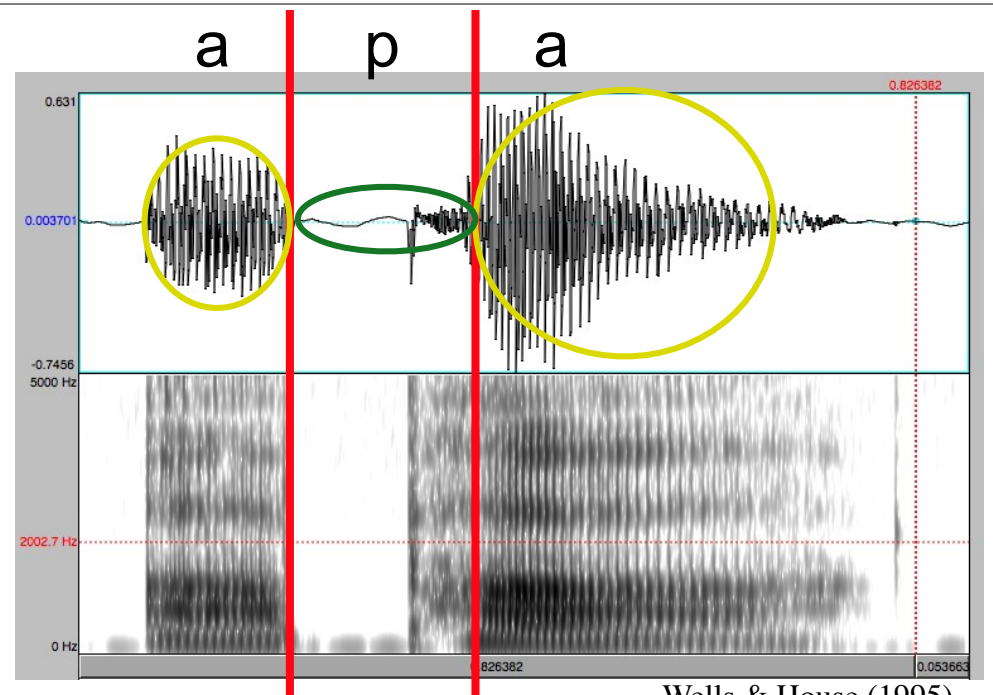
Vowels and consonants? - **acoustic** characteristics

- **Vowel**: greater energy, amplitude.
- **Consonant**: smaller energy, amplitude.
- -> demonstration: oscillogram and spectrogram. What do they **LOOK** like?



Vowels and consonants? - **perceptual** characteristics

- **Vowel**: louder.
- **Consonant**: less loud.



Classification of consonants: voice, place, manner

English Consonants - how can we classify them?

Three main properties:

- **VOICE**
- **PLACE** of articulation
- **MANNER** of articulation

English Consonants

- how can we classify them?

		Place of articulation							
		Front → Back							
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal
Manner of articulation	plosive	p b			t d			k g	
	affricate					tʃ dʒ			
	fricative		f v	θ ð	s z	ʃ ʒ			h
	nasal	m			n			ŋ	
	lateral				l				
	approximant	(w)				r	j	w	

(Unvoiced phonemes are on a shaded background. Voiced phonemes are on a white background.)
Kelly (2000)

1. VOICE

- Presence or absence of vocal fold vibration.
- Absence -> **VOICELESS** (or UNVOICED) consonants
- Presence -> **VOICED** consonants

Demo
acoustic
10

T. Kamiyama

Phonetics and Phonology Lecture 5

English Consonants

- how can we classify them?

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Manner of articulation	plosive	p b			t d			k g	
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	fricative		f v	θ ð	s z	ʃ ʒ			h
	nasal	m			n			ŋ	
					l				
	approximant	(w)				r	j	w	

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Kelly (2000)

2. PLACE of articulation

- Place where the airstream is blocked (completely or incompletely).

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Phonetics and Phonology Lecture 5

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Places of articulation

		Table of English Consonant Phonemes									
		Place of articulation									
		Front					Back				
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	nasal	m			n						
	lateral				l						
	approximant	(w)				r	j		w		

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Kelly (2000)

Places of articulation

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	fricative		f v	θ ð	s z	ʃ ʒ				h	
	nasal	m			n						
	lateral				l						
	approximant	(w)				r	j		w		

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Wells & House (1995) Kelly (2000)

Places of articulation

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	fricative		f v	θ ð	s z	ʃ ʒ				h	
	nasal	m			n						
	lateral				l						
	approximant	(w)				r	j		w		

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Places of articulation

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	lateral				l						
	approximant	(w)				r	j		w		

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Wells & House (1995) Kelly (2000)

Places of articulation

Table of English Consonant Phonemes

		Place of articulation									
		Front	(inter)						Back		
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal		
Manner of articulation	plosive	p b			t d				k g		
	affricate					tʃ dʒ					
	fricative		f v	θ ð	s z	ʃ ʒ				h	
	nasal	m			n					ŋ	
	lateral				l						
	approximant	(w)					r	j		w	

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Kelly (2000)

Places of articulation

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		Front	(inter)						Back		
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	fricative		f v	θ ð	s z	ʃ ʒ				h	
	nasal	m			n					ŋ	
	lateral				l						
	approximant	(w)					r	j		w	

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Kelly (2000)

Places of articulation

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Places of articulation

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	fricative		f v	θ ð	s z	ʃ ʒ				h	
	nasal	m			n					ŋ	
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Wells & House (1995) Kelly (2000)

Places of articulation

Table of English Consonant Phonemes

		Place of articulation									
		Front								Back	
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal		
Manner of articulation	plosive	p	b		t	d				k	g
	affricate					tʃ	dʒ				
	fricative		f	v	θ	ð	s	z	ʃ	ʒ	h
	nasal						n				ŋ
	lateral						l				
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Kelly (2000)

Places of articulation

Table of English Consonant Phonemes

		Place of articulation									
		Front						post-alveolar		Back	
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal		
Manner of articulation	plosive	p	b		t	d				k	g
	affricate					tʃ	dʒ				
	fricative		f	v	θ	ð	s	z	ʃ	ʒ	h
	nasal						n				ŋ
	lateral						l				
	approximant	(w)						r	j		w

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Kelly (2000)

Places of articulation

Table of English Consonant Phonemes

		Place of articulation									
		Front						post-alveolar		Back	
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal		
Manner of articulation	plosive	p	b		t	d				k	g
	affricate					tʃ	dʒ				
	fricative		f	v	θ	ð	s	z	ʃ	ʒ	h
	nasal						n				ŋ
	lateral						l				
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Kelly (2000)

Places of articulation

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		Place of articulation									
		Front						post-alveolar		Back	
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal		
Manner of articulation	plosive	p	b		t	d				k	g
	affricate					tʃ	dʒ				
	fricative		f	v	θ	ð	s	z	ʃ	ʒ	h
	nasal						n				ŋ
	lateral						l				
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Wells & House (1995) Kelly (2000)

Places of articulation

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	fricative		f	v	θ	ð	s	z	ʃ	ʒ
	nasal	m					n		ŋ	
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Places of articulation

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	approximant	(w)					j	w		

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Kelly (2000)

Places of articulation: summary

Place of articulation	
bilabial	using closing movement of both lips, e.g. /p/ and /m/
labio-dental	using the lower lip and the upper teeth, e.g. /f/ and /v/
dental (interdental)	the tongue tip is used either between the teeth or close to the upper teeth, e.g. /θ/ and /ð/
alveolar	the blade of the tongue is used close to the alveolar ridge, e.g. /t/ and /s/
palato-alveolar	the blade (or tip) of the tongue is used just behind the alveolar ridge, e.g. /tʃ/ and /dʒ/
palatal	the front of the tongue is raised close to the palate, e.g. /j/
velar	the back of the tongue is used against the soft palate, e.g. /k/ and /ŋ/
glottal	the gap between the vocal folds is used to make audible friction, e.g. /h/

3. MANNER of articulation

- How and to what extent the airstream is blocked (completely, incompletely).

Manners of articulation

Table of English Consonant Phonemes								
	Place of articulation							
	Front				Back			
	bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal
Complete closure	plosive	p b		t d			k g	
Manner of articulation	affricate				tʃ dʒ			
	fricative		f v	θ ð	s z	ʃ ʒ		h
	nasal	m			n			ŋ
	lateral				l			
	approximant	(w)				r	j	w
	Incomplete closure							

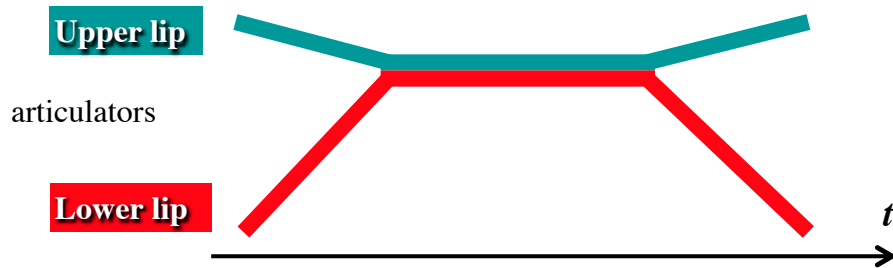
(// indicates phonemes on a shaded background. Voiced phonemes are on a light background.)

Manners of articulation

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	Place of articulation							
	Front				Back			
	bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal
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Manner of articulation	affricate				tʃ dʒ			
	fricative		f v	θ ð	s z	ʃ ʒ		h
	nasal	m			n			ŋ
	lateral				l			
	approximant	(w)				r	j	w
	Incomplete closure							

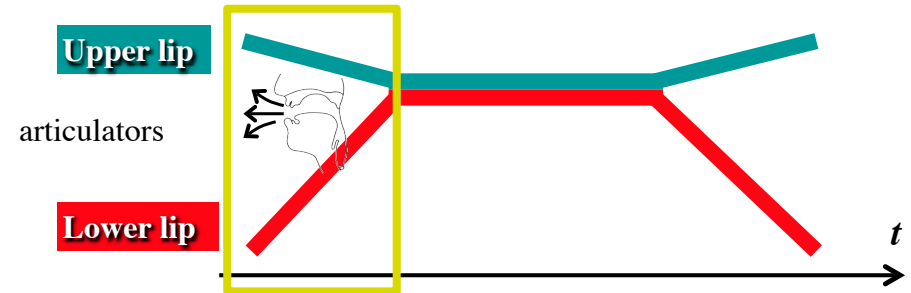
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Plosives (or stops): the case of the bilabial plosives



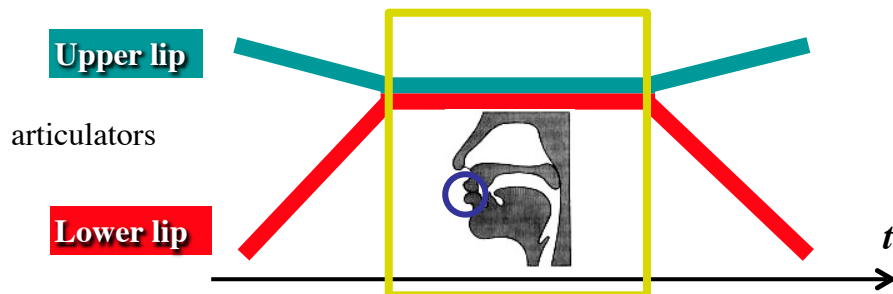
- 4 phases

Plosives (or stops): the case of the bilabial plosives



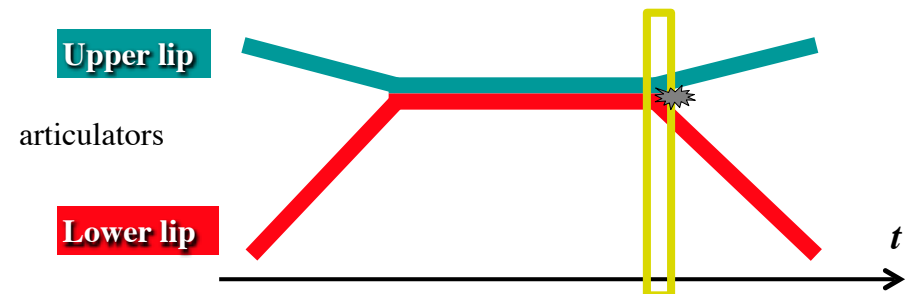
- **1. Closure phase:** one articulator moves toward another, or two articulators move toward each other, so as to form a stricture that allows no air to escape from the vocal tract.

Plosives (or stops): the case of the bilabial plosives



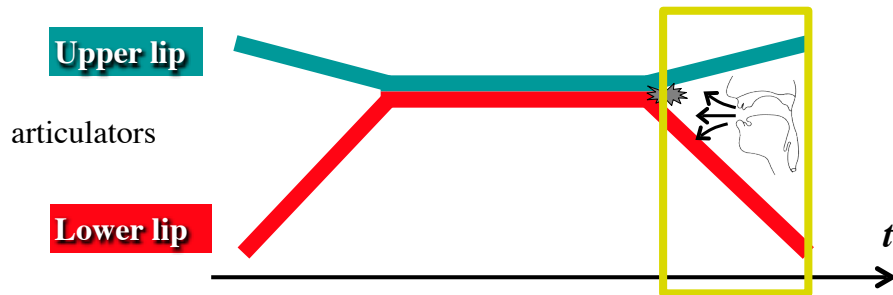
- **2. Hold phase:** a total stricture is formed. No air escapes from the vocal tract. Air is compressed behind the stricture and the air pressure rises.

Plosives (or stops): the case of the bilabial plosives



- **3. Release phase:** as the articulators (the upper and lower lips) move apart, the airstream is released in a small burst (called plosion).

Plosives (or stops): the case of the bilabial plosives



- **4. Post-release phase** : the articulators (the upper and lower lips) move further away.

Plosives (or stops): the case of the bilabial plosives

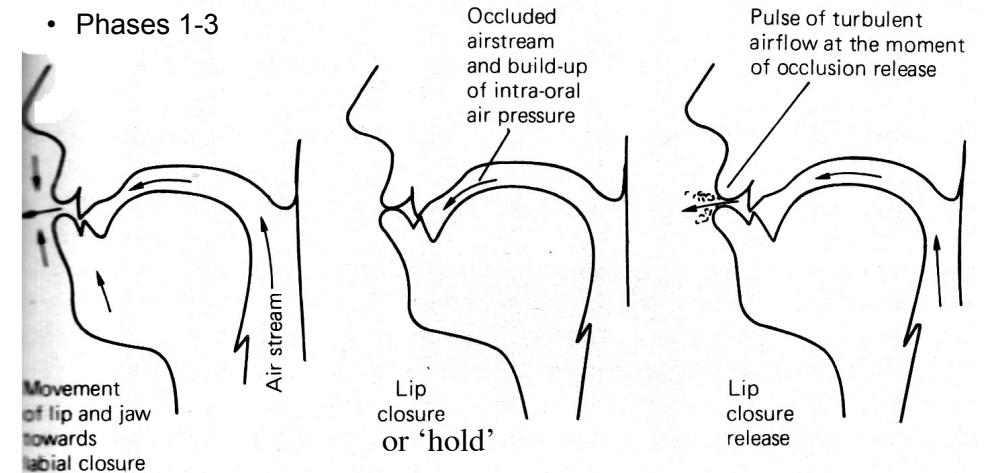


FIGURE 2.12.1 Phases of a bilabial plosive

Clark & Yallop (1995)

Plosives (or stops): the case of the bilabial plosives

- Acoustics and perception: demonstration

Manners of articulation

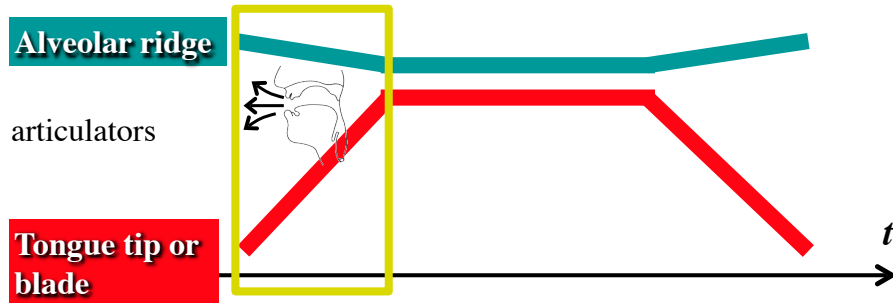
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Manner of articulation	Complete closure	plosive	p b		t d			k g	
	affricate					tʃ dʒ			
	Fricative		f v θ ð s z ʃ ʒ						h
	nasal		m		n			ŋ	
	lateral				l				
	approximant		(w)			r	j	w	

(Phonemes on a shaded background. Voiced phonemes are on a light background.)

Wells & House (1995) Kelly (2000)

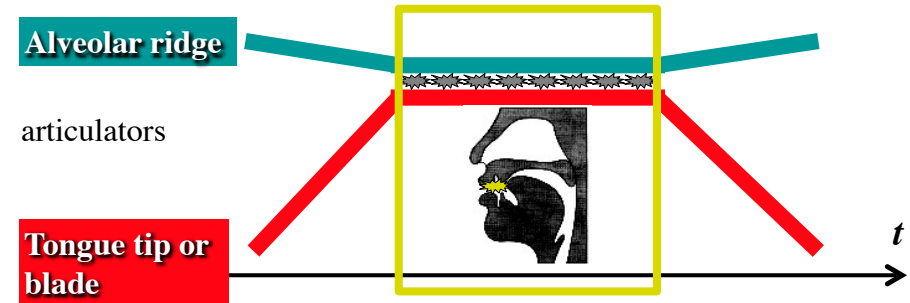
Incomplete closure

Fricatives: the case of the alveolar fricatives



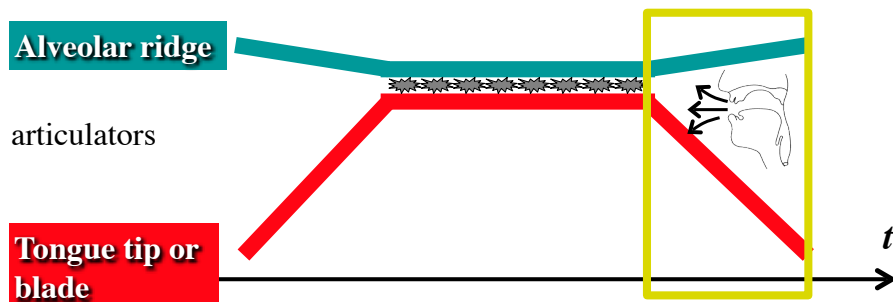
- **Phase 1:** one articulator moves toward another, or two articulators move toward each other, so as to form a stricture with a very narrow passage.

Fricatives: the case of the alveolar fricatives



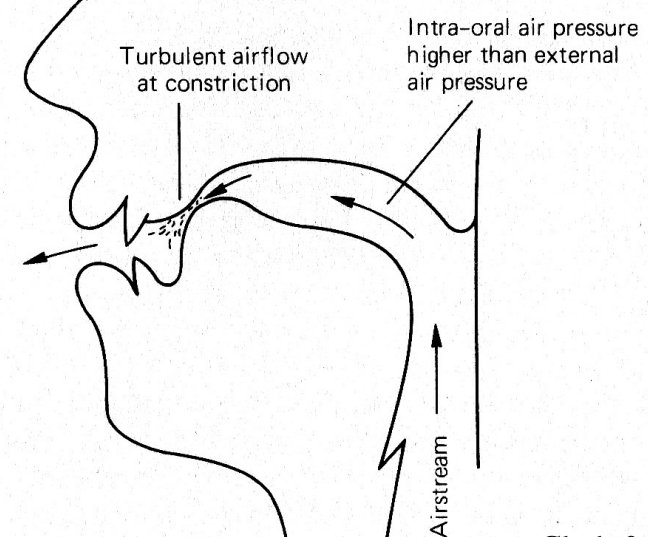
- **Phase 2:** the airstream passes through the narrow passage between the articulators, creating a continuous hissing sound (heard as friction) caused by turbulent airflow.

Fricatives: the case of the alveolar fricatives



- **Phase 3:** the articulators (the tongue blade and the alveolar ridge) move away.

Fricatives: the case of the alveolar fricatives



Clark & Yallop (1995)

FIGURE 2.12.2 Articulation of a voiceless alveolar fricative [s] 44

Fricatives: the case of the alveolar fricatives

- Acoustics and perception: demonstration

Manners of articulation

		Place of articulation							
		Front				Back			
Manner of articulation	Complete closure	bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal
	plosive	p b			t d			k g	
	affricate					tʃ dʒ			
	fricative		f v	θ ð	s z	ʃ ʒ			h
	nasal	m			n			ŋ	
	lateral				l				
approximant	(w)					r	j	w	

(Phonemes are on a shaded background. Voiced phonemes are on a light background.)

Incomplete closure

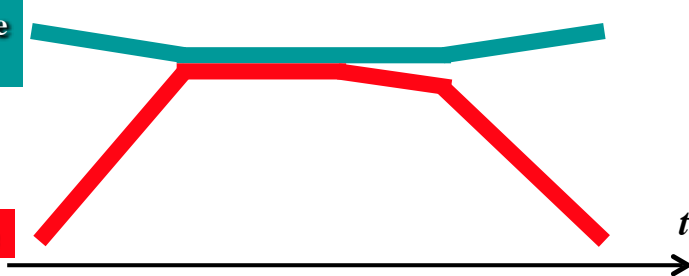
Kelly (2000)

Affricates: the case of the palato-alveolar affricates

Alveolar ridge - hard palate

articulators

Tongue blade



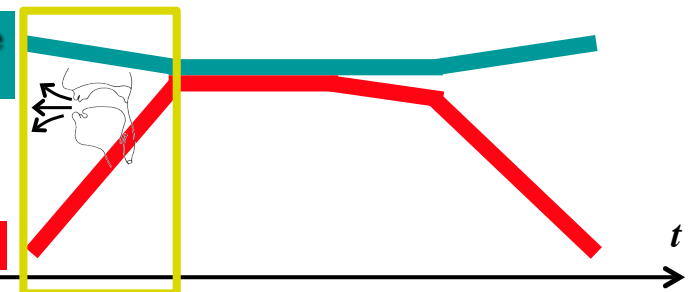
- Affricate:** plosive (stop) + fricative.

Affricates: the case of the palato-alveolar affricates

Alveolar ridge - hard palate

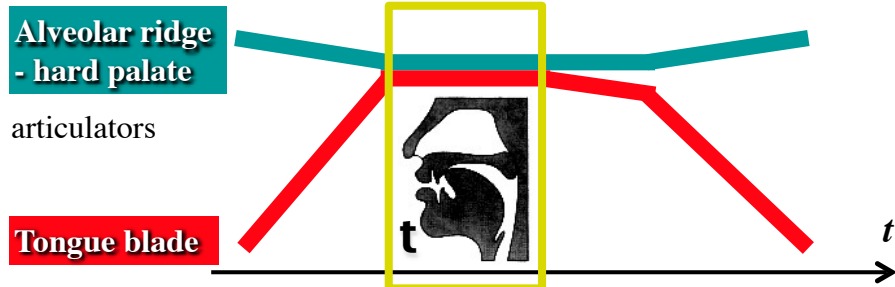
articulators

Tongue blade



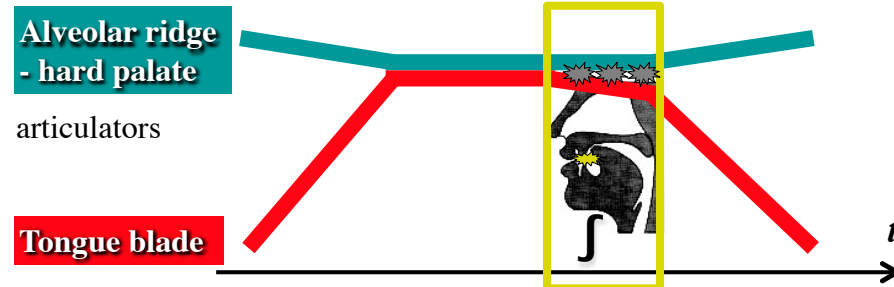
- 1. Closure phase:** one articulator moves toward another, or two articulators move toward each other, so as to form a stricture that allows no air to escape from the vocal tract.

Affricates: the case of the palato-alveolar affricates



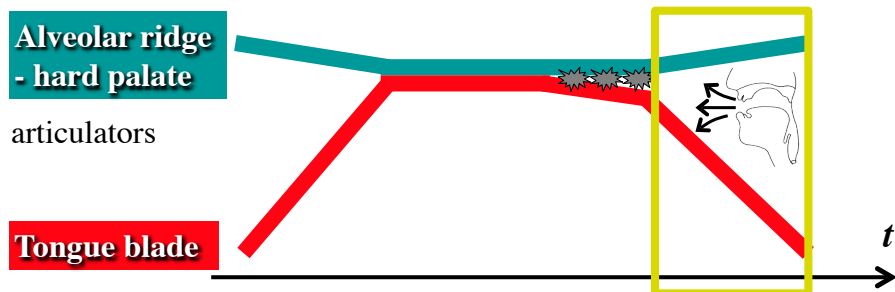
- **2. Hold phase:** a total stricture is formed. No air escapes from the vocal tract. Air is compressed behind the stricture and the air pressure rises.

Affricates: the case of the palato-alveolar affricates



- **3. Friction phase:** the articulators move apart, but not as rapidly as in plosives. They stay close enough to create a turbulent airflow, causing a hissing sound as in a fricative.

Affricates: the case of the palato-alveolar affricates



- **Phase 4:** the articulators (the tongue blade and the alveolar ridge) move away.

Affricates: the case of the palato-alveolar affricates

- Acoustics and perception: demonstration

Manners of articulation

		Place of articulation							
		Front				Back			
Manner of articulation		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal
	plosive		p b			t d			k g
affricate						tʃ dʒ			
fricative			f v	θ ð	s z	ʃ ʒ			h
nasal		m			n			ŋ	
lateral					l				
approximant		(w)				r	j	w	

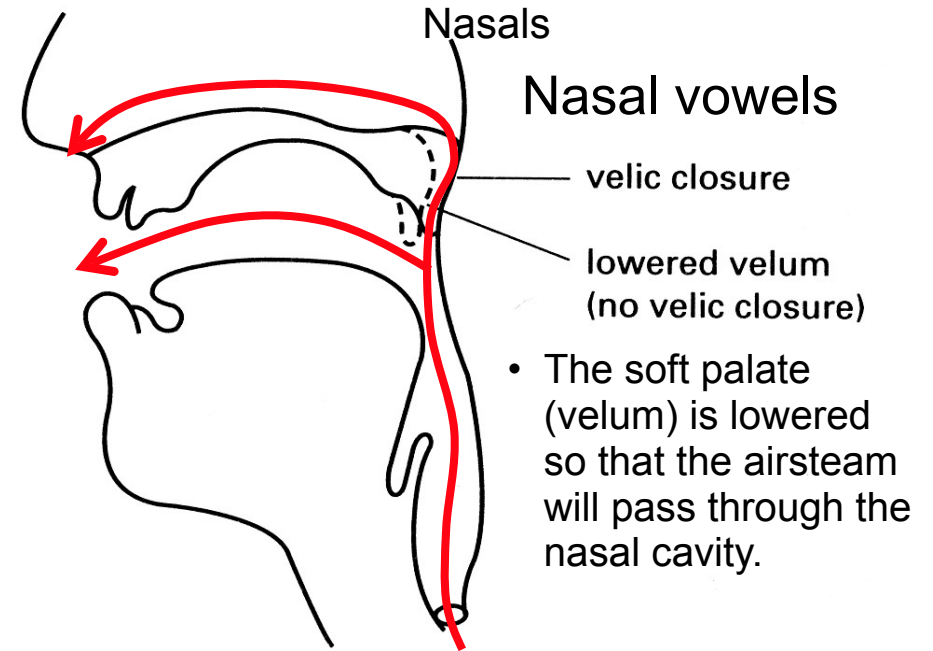
Complete closure



Incomplete closure

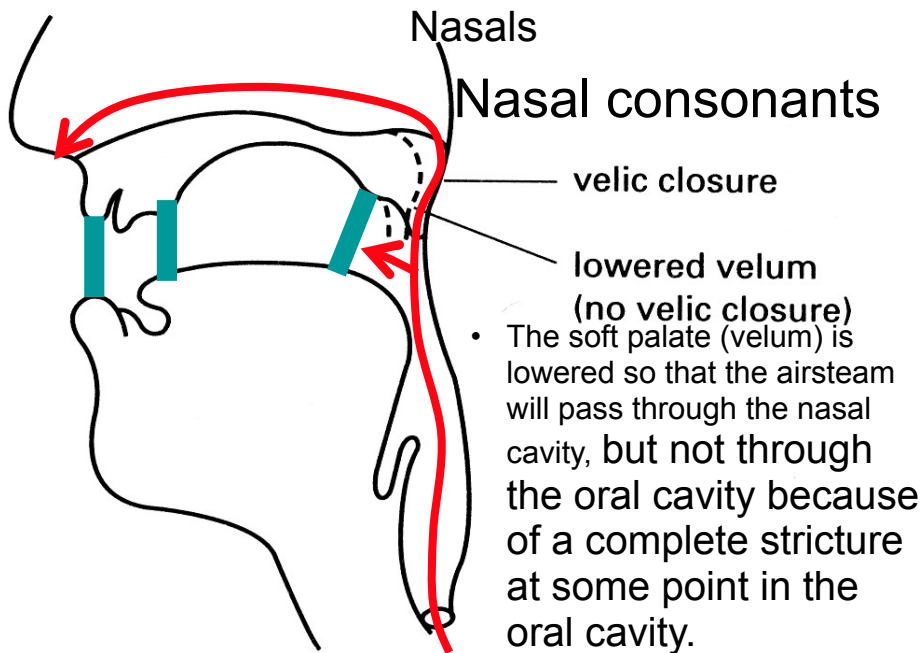
(// phonemes are on a shaded background. Voiced phonemes are on a light background.)

Wells & House (1995) Kelly (2000)



- The soft palate (velum) is lowered so that the airstream will pass through the nasal cavity.

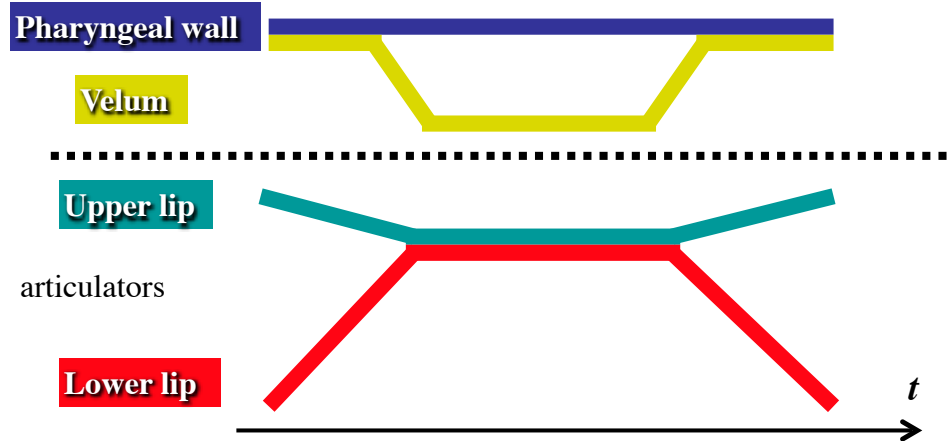
5.2 Velic closure P. Ashby (1995)



- The soft palate (velum) is lowered so that the airstream will pass through the nasal cavity, but not through the oral cavity because of a complete stricture at some point in the oral cavity.

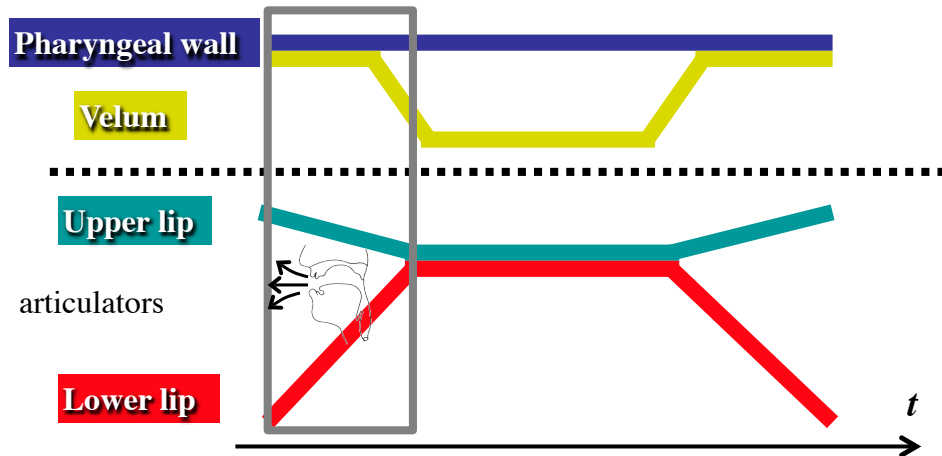
5.2 Velic closure P. Ashby (1995)

Nasals: the case of the bilabial nasal



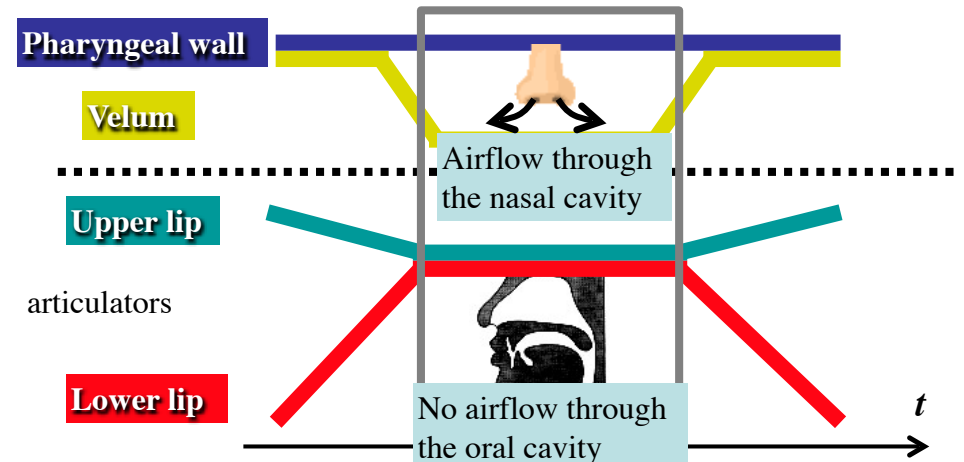
- phases

Nasals: the case of the bilabial nasal



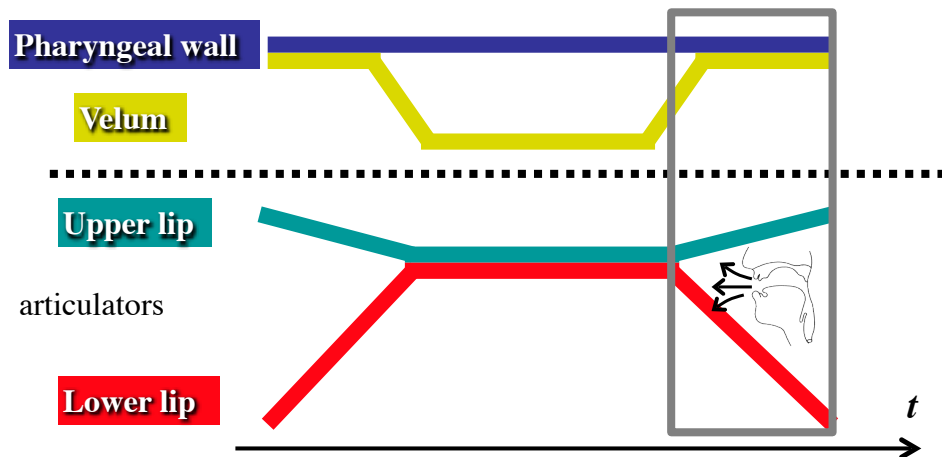
- Phase 1: the velum is lowered as the articulators (lips) approach each other.

Nasals: the case of the bilabial nasal



- Phase 2: air flows out through the nose, but not from the mouth.

Nasals: the case of the bilabial nasal



- Phase 3: the velum is raised again (if the following sound is oral) as the articulators (lips) come apart.

Nasals: the case of the bilabial nasal

- Acoustics and perception: demonstration

Manners of articulation

		Place of articulation									
		Front				Back					
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal		
Manner of articulation	plosive	p	b		t	d			k	g	
	affricate					tʃ	dʒ				
	fricative		f	v	θ	ð	s	z	ʃ	ʒ	h
	nasal		m			n				ŋ	
	lateral					l					
approximant		(w)				r	j	w			

Complete closure

Manner of articulation

Incomplete closure

(// phonemes are on a shaded background. Voiced phonemes are on a light background.) Wells & House (1995) Kelly (2000)

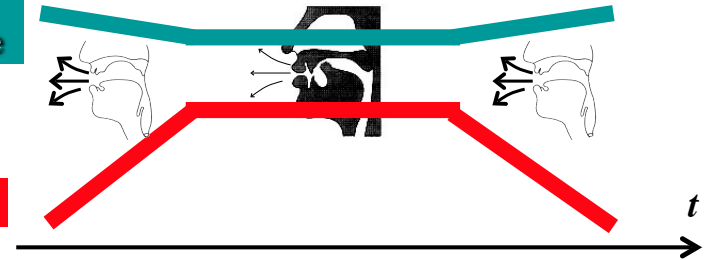
Approximants:

the case of the palato-alveolar (post-alveolar) approximant

Back of the alveolar ridge

articulators

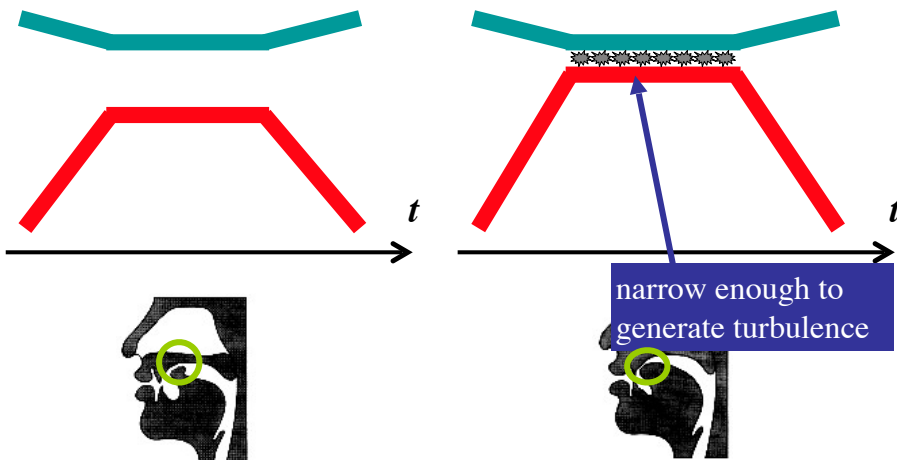
Tongue tip



- The articulators come close, but not enough to create turbulence: there is no hissing sound.

- Compare: Approximants

Fricatives



narrow enough to generate turbulence

Manners of articulation

		Place of articulation									
		Front				Back					
		bilabial	labio-dental	dental	alveolar	palato-alveolar	palatal	velar	glottal		
Manner of articulation	plosive	p	b		t	d			k	g	
	affricate					tʃ	dʒ				
	fricative		f	v	θ	ð	s	z	ʃ	ʒ	h
	nasal		m			n				ŋ	
	lateral approximant					l					
approximant		(w)				r	j	w			

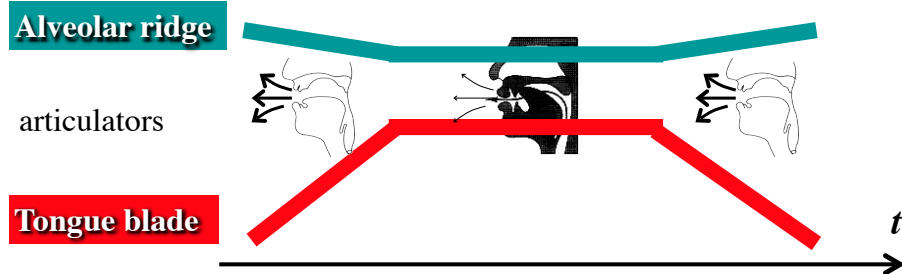
Complete closure

Manner of articulation

Incomplete closure

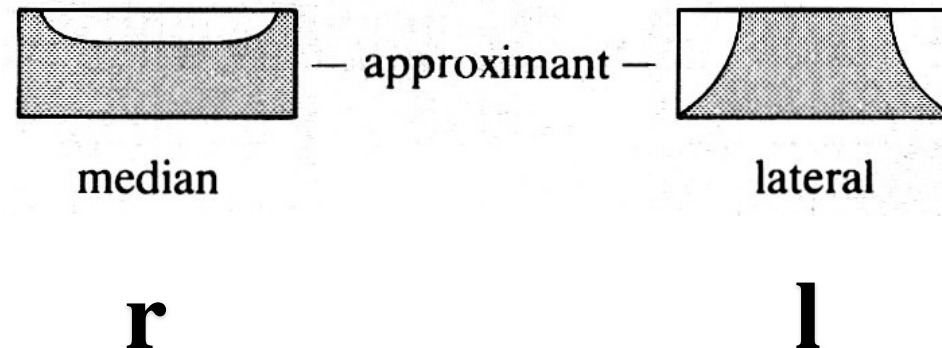
(// phonemes are on a shaded background. Voiced phonemes are on a light background.) Wells & House (1995) Kelly (2000)

Lateral approximants: the case of the alveolar lateral approximant



- The articulators come close and make a complete closure in the centre of the vocal tract, but air escapes through one or both sides: there is no hissing sound.

- Compare:



Catford (1988)

Manners of articulation: summary

Manner of articulation	
plosive (or stop)	a complete closure is made somewhere in the vocal tract, and the soft palate is also raised. Air pressure increases behind the closure, and is then released 'explosively', e.g. /p/ and /b/
affricate	a complete closure is made somewhere in the mouth, and the soft palate is raised. Air pressure increases behind the closure, and is then released more slowly than in plosives, e.g. /tʃ/ and /dʒ/
fricative	when two vocal organs come close enough together for the movement of air between them to be heard, e.g. /f/ and /v/
nasal	a closure is made by the lips, or by the tongue against the palate, the soft palate is lowered, and air escapes through the nose, e.g. /m/ and /n/
lateral (lateral approximant)	a partial closure is made by the blade of the tongue against the alveolar ridge. Air is able to flow around the sides of the tongue, e.g. /l/
approximant	vocal organs come near to each other, but not so close as to cause audible friction, e.g. /r/ and /w/