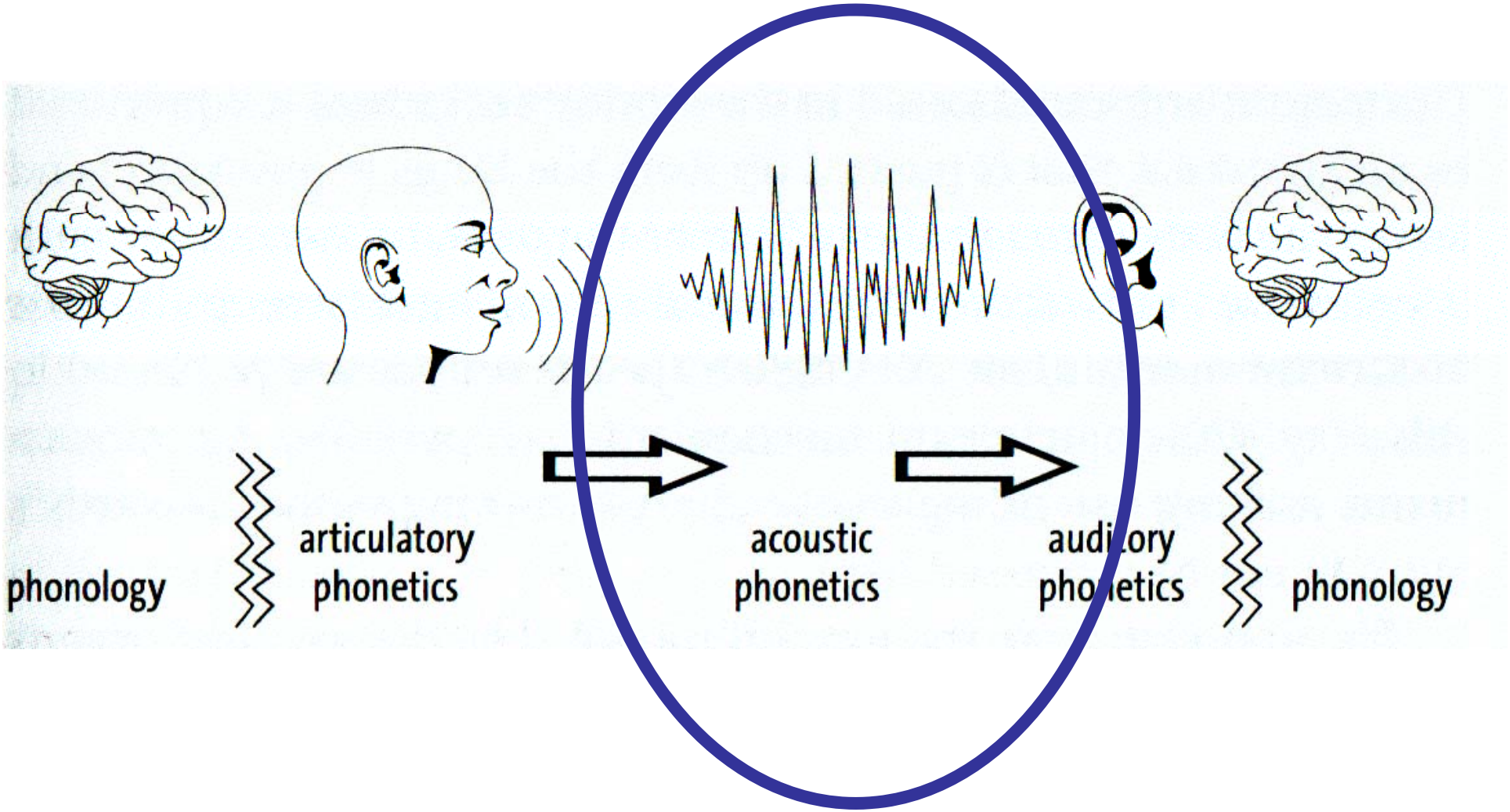
Moving from sounds to language

—

from phonetics to phonology

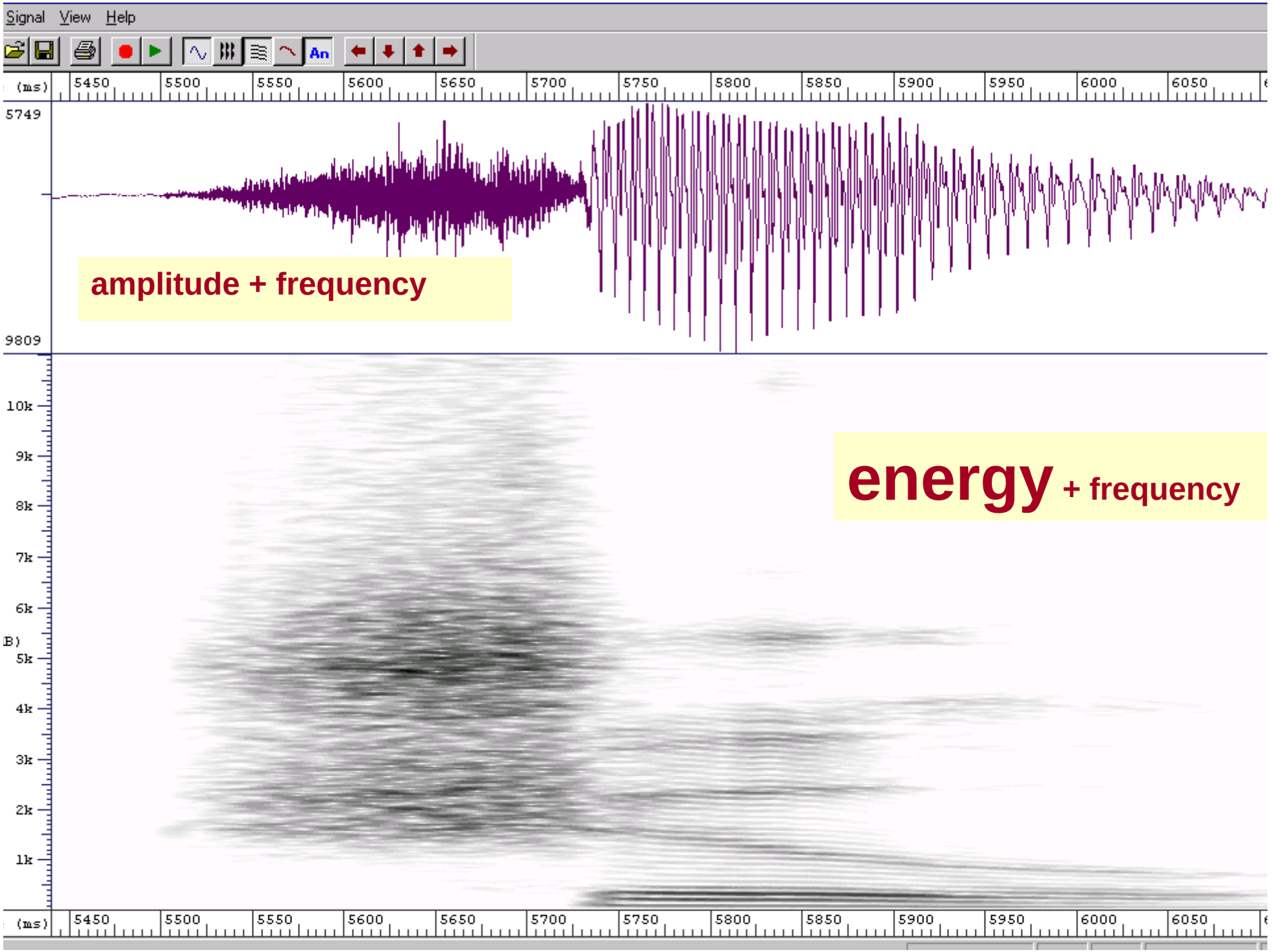


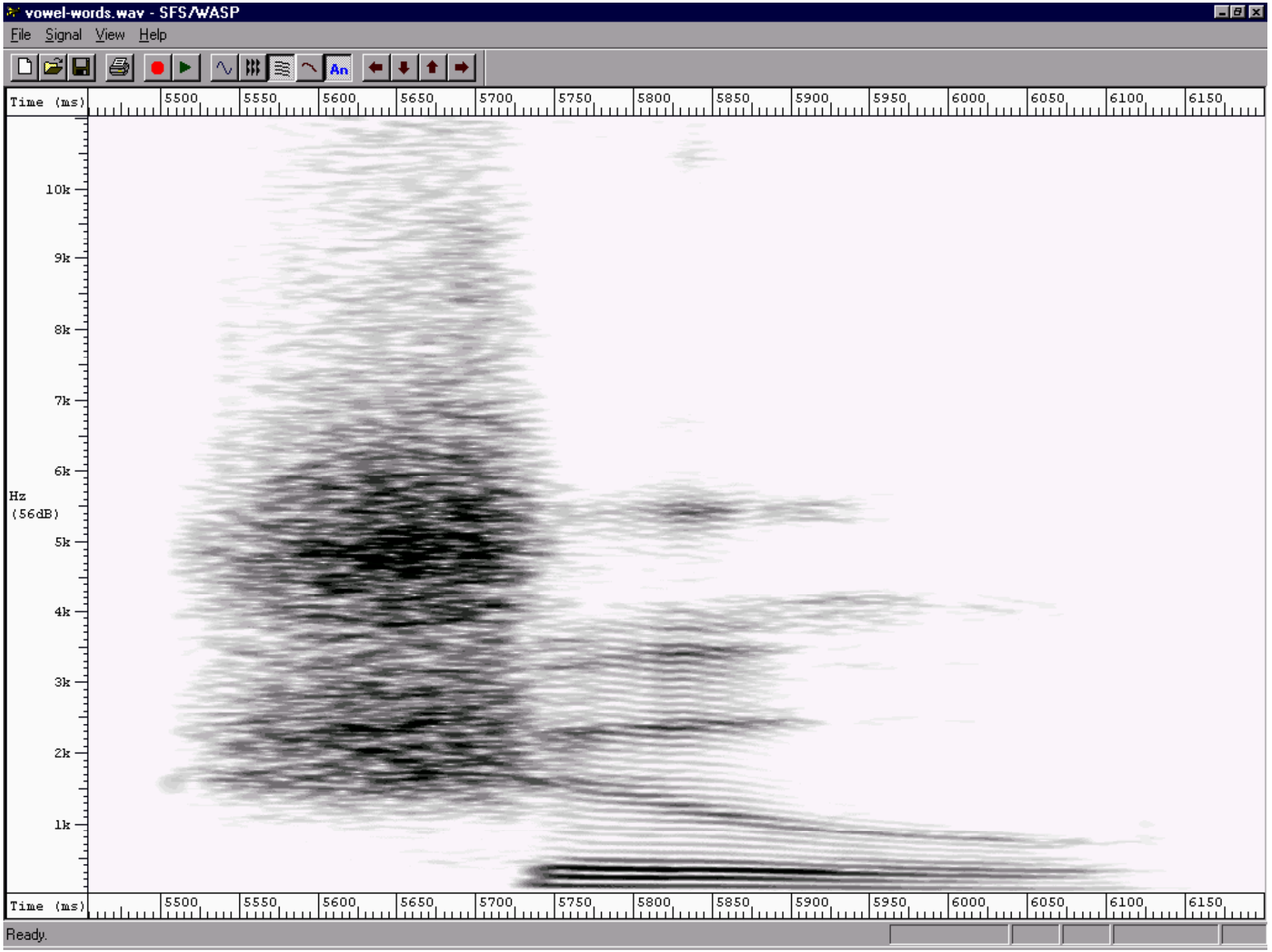
Introduction to English Linguistics
(Bieswanger / Becker)

Fig. 3.2
The speech chain

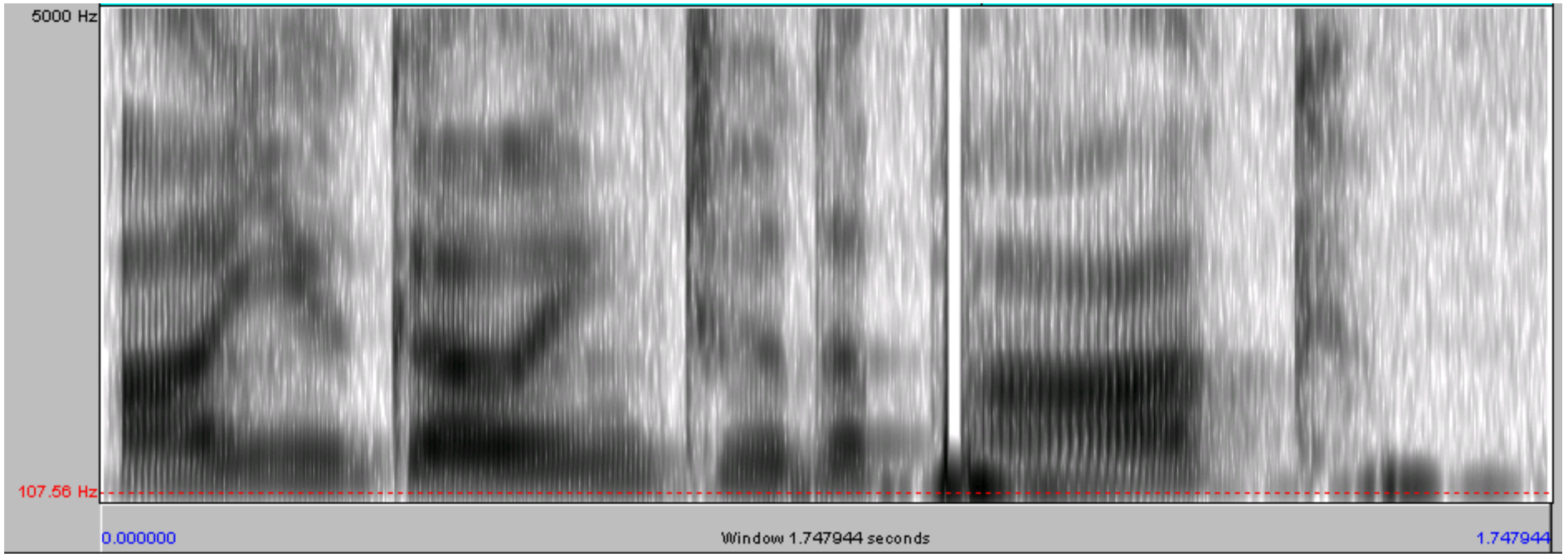
Sound

- what is it?
- what features does it have?
- and how can you tell one **language** sound from another??

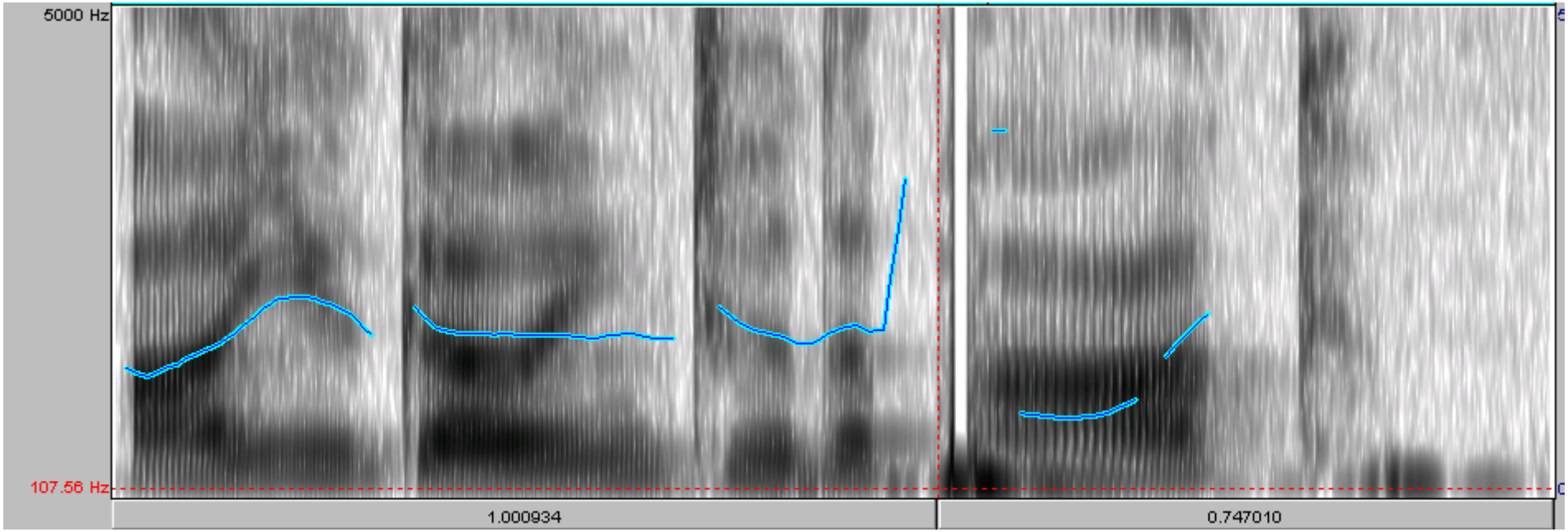

Signal View Help
(ms)
5450
5500
5550
5600
5650
5700
5750
5800
5850
5900
5950
6000
6050
5749
9809
amplitude + frequency
10k
9k
8k
7k
6k
5k
4k
3k
2k
1k
energy + frequency


vowel-words.wav - SFS/WASP
File Signal View Help
An
Time (ms)
5500 5550 5600 5650 5700 5750 5800 5850 5900 5950 6000 6050 6100 6150
10k
9k
8k
7k
6k
Hz
(56dB)
5k
4k
3k
2k
1k
Time (ms)
5500 5550 5600 5650 5700 5750 5800 5850 5900 5950 6000 6050 6100 6150
Ready.

SPECTROGRAMS

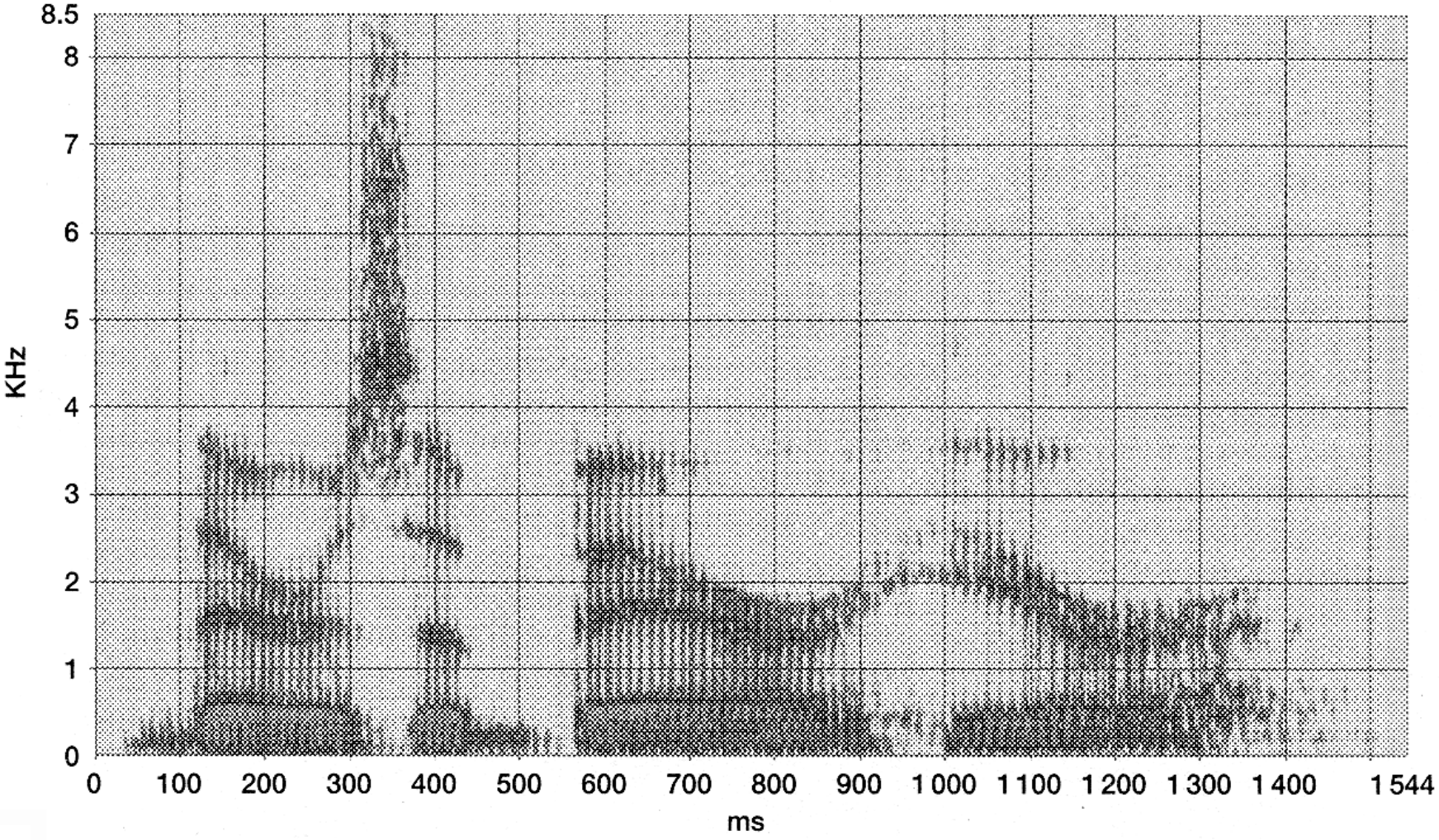


Are you g o ing to the p a r k ?



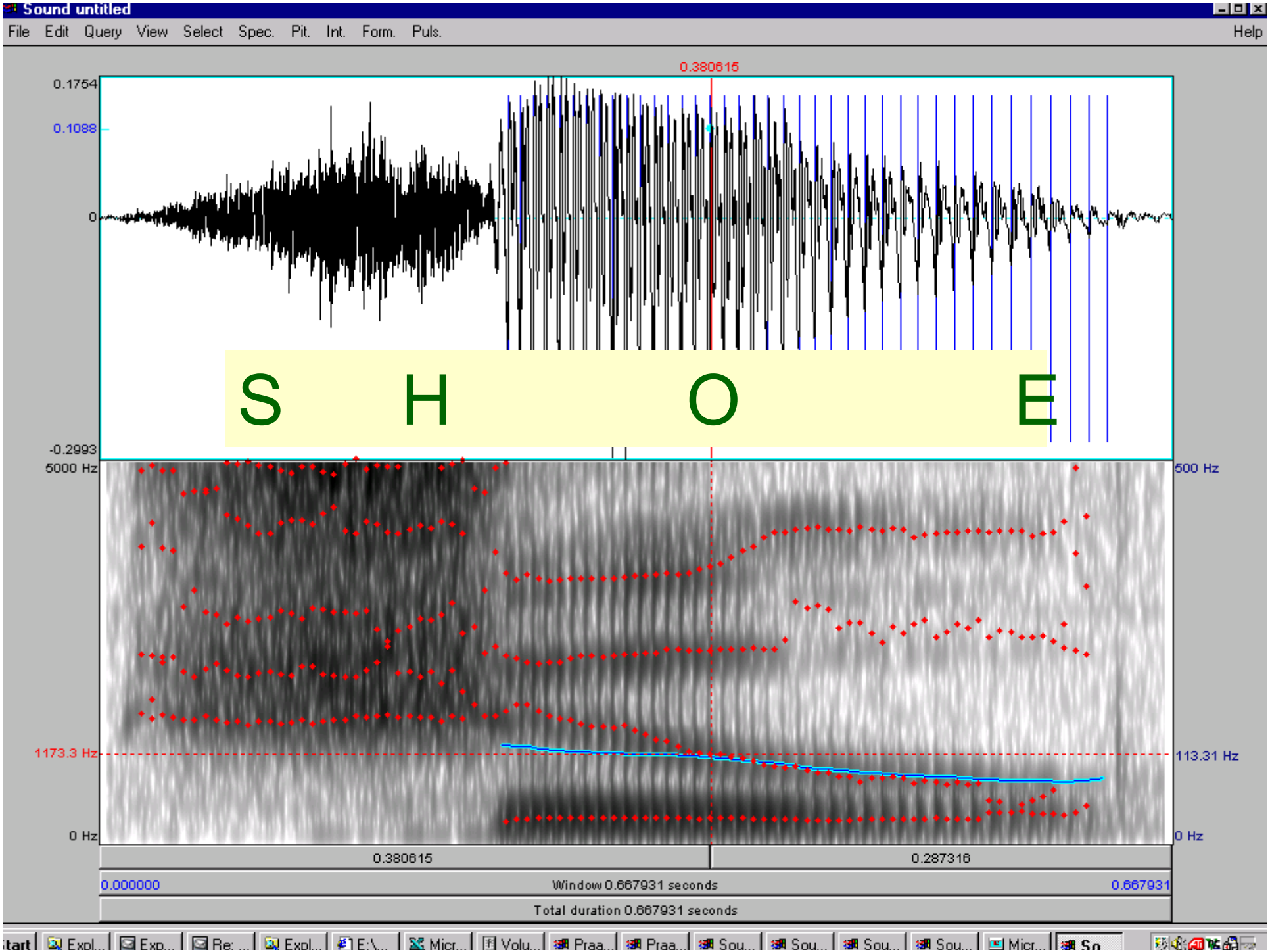
Are you g o ing to the p a r k ?

Acoustic Phonetics

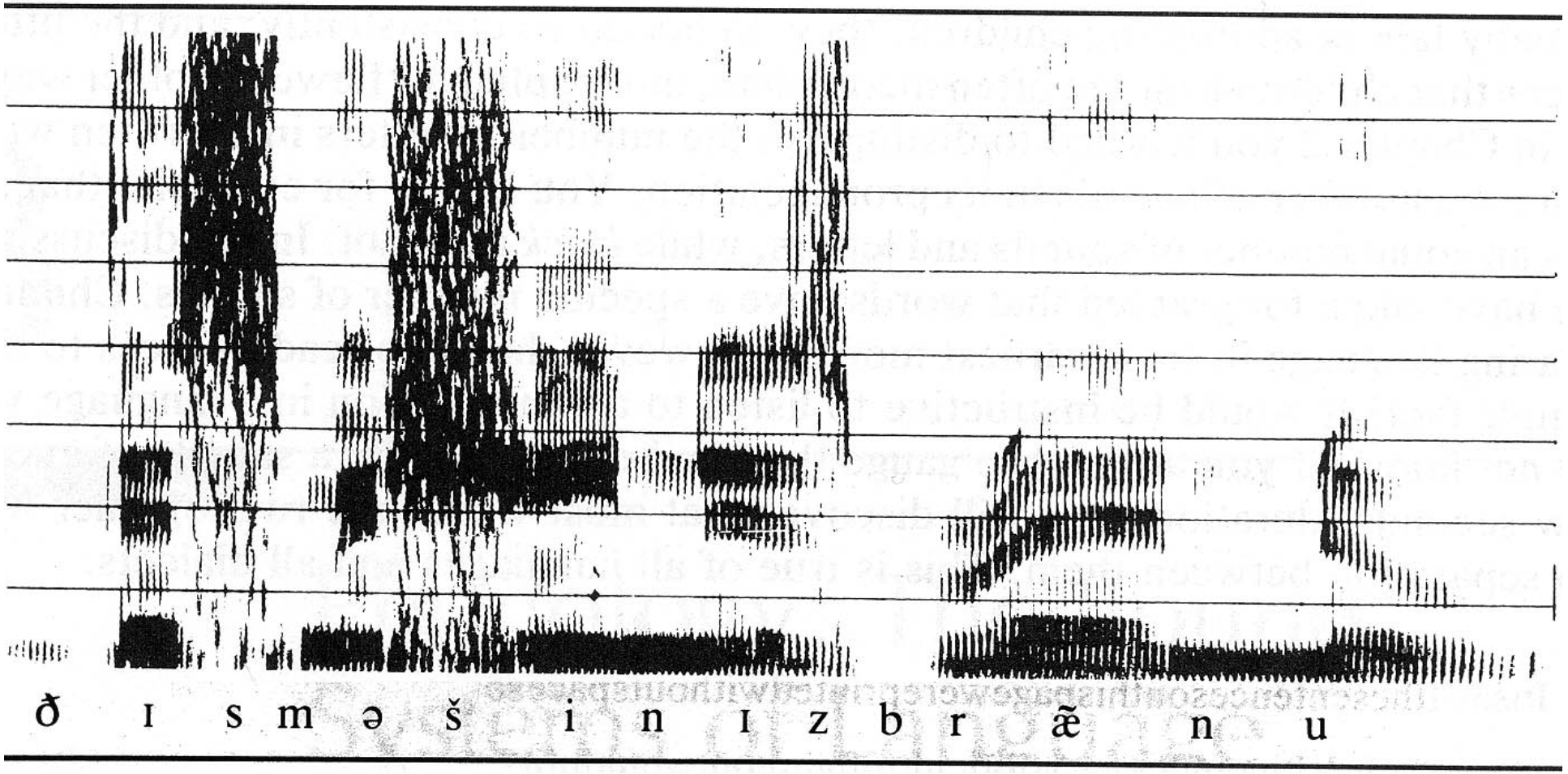


there's a bear here

from: Mike Davenport and S.J. Hannahs
Introducing Phonetics and Phonology. 1998, p66

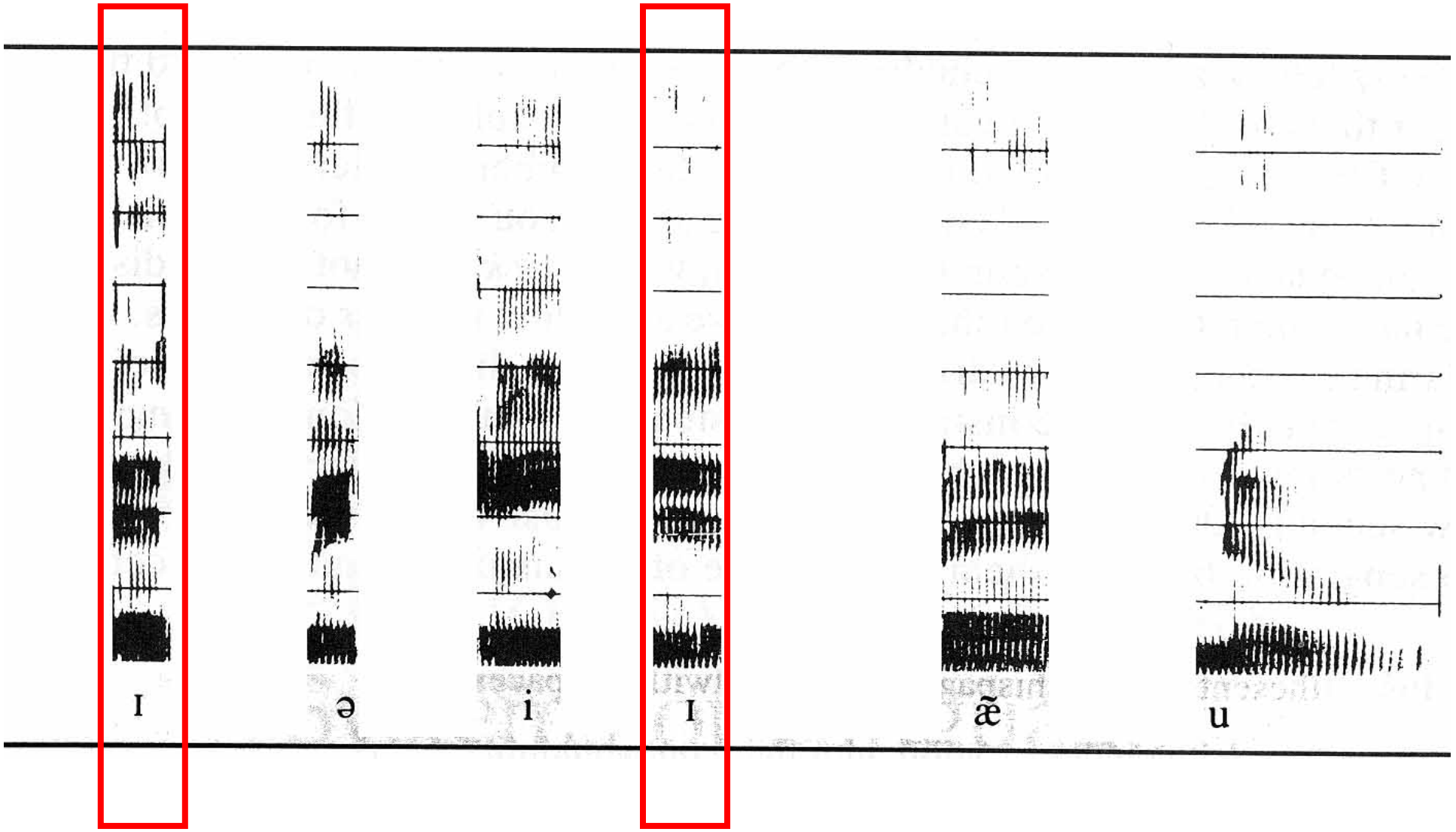

Sound untitled
File Edit Query View Select Spec. Pit. Int. Form. Puls. Help
0.380615
0.1754
0.1088
0
-0.2993
S H O E
5000 Hz
500 Hz
1173.3 Hz
113.31 Hz
0 Hz
0 Hz
0.380615
0.287316
0.000000
Window 0.667931 seconds
0.667931
Total duration 0.667931 seconds

Speech: sound spectogram



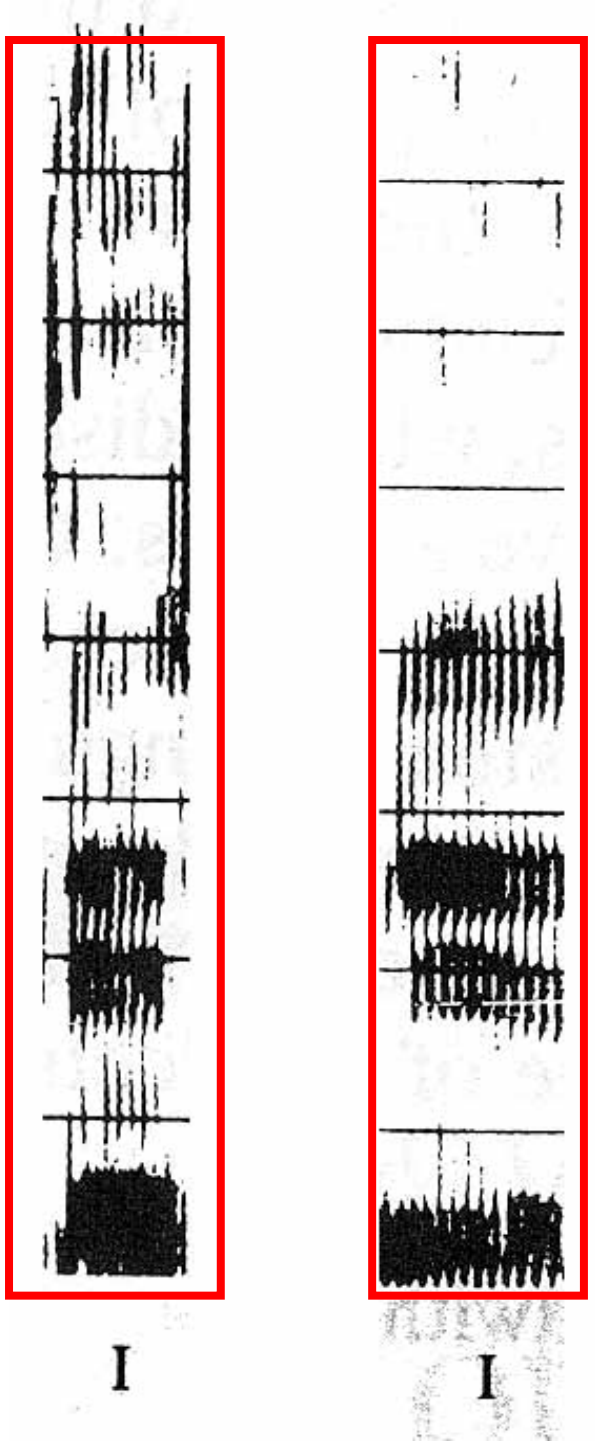
from: Edward Finegan
Language: its structure and use. 1994, p52

Speech: vowels only



Sound analysis:

the two occurences of ‘I’ in the phrase

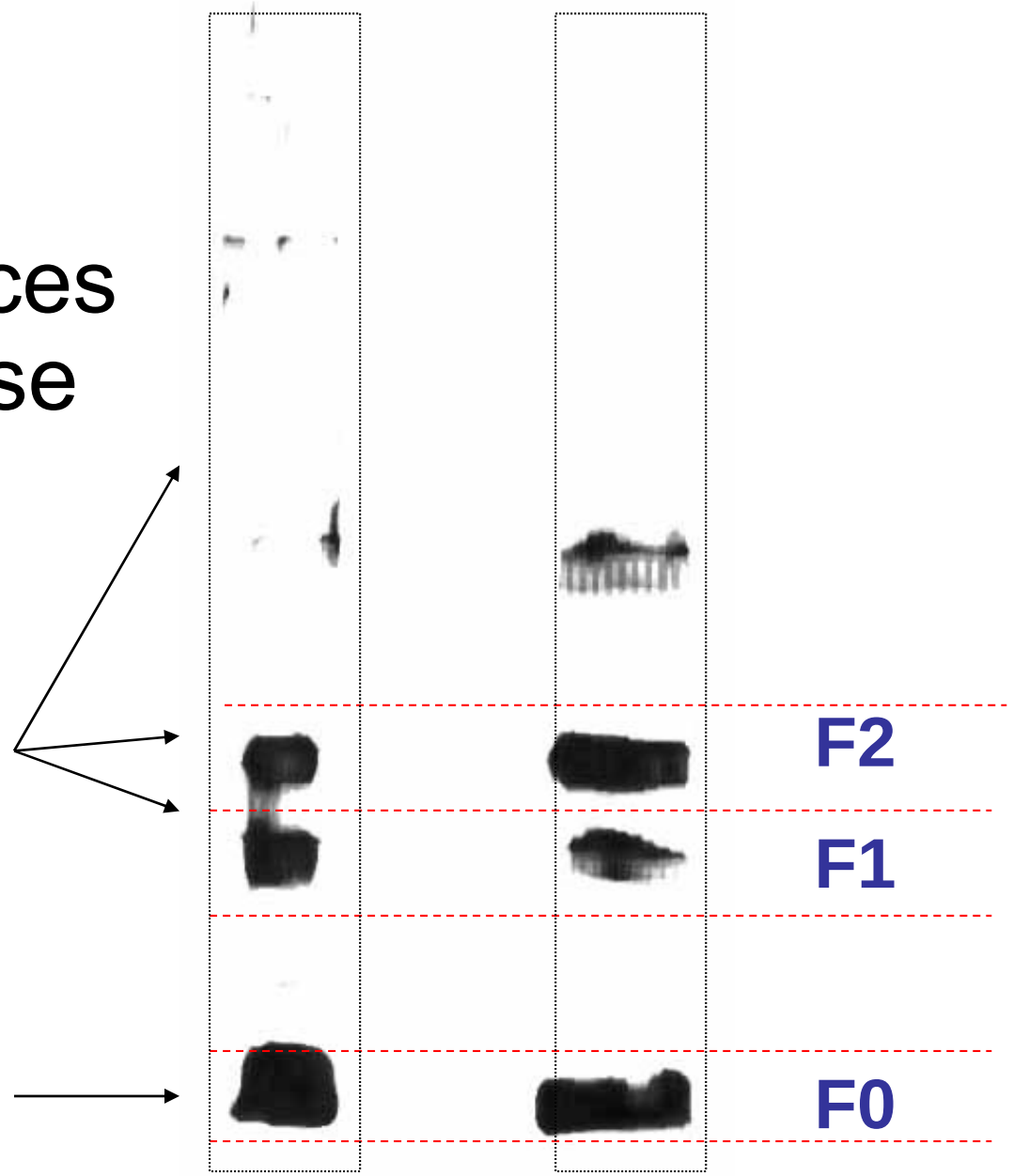


Sound analysis:

the two occurences of ‘I’ in the phrase

FORMANTS

‘fundamental frequency’



Working with the sounds of language...

For example: the ‘praat’ system, freely available and downloadable for your PC

http://www.praat.org

Examining a ‘speech signal’ with Praat: Instructions

1. Get your own copy of the speech processing program **`praat`** from www.praat.org
2. Start the program
3. Record some sound and look at it:
   - **`New>Record Mono Sound`**
   - **`Record ... Stop`**
   - **`To list: “name”`**
   - **`Edit`**
4. You can then select any portion of the signal to play and to measure its physical acoustic properties...

Big question

- how to get from these blobs of energy with different frequencies to language?
  - hypothesis: that we ‘somehow’ recognise when particular phonetic features are present...

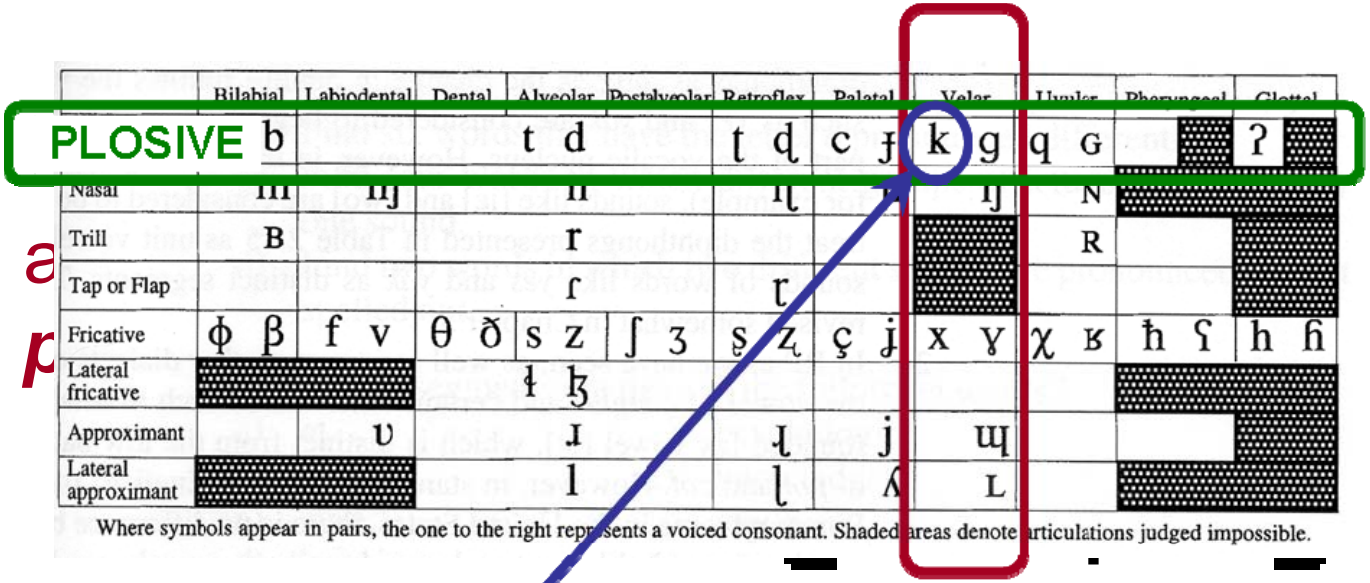
Evidence for Phonetic Features: speech errors

Describing Sounds

IPA

k

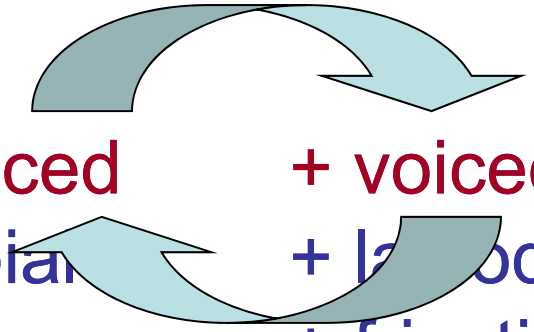
voicing?	nasality?	place?	manner?
NO	NO	VELAR	PLOSIVE



“distinguishing features”

Example 1

Intended	*Actually produced*
big and fat	**pig and vat**



+ voiced	- voiced	- voiced	+ voiced
+ labial	+ labiodental	+ labial	+ labiodental
+ stop	+ fricative	+ stop	+ fricative

► <u>voicing</u> is known about separately to the other features

Example 2

Intended	*Actually produced*
Is Pat a girl?	**Is bat a curl?**

Example 2

Intended	*Actually produced*
Is Pat a girl?	**Is bat a curl?**

- voiced	+ voiced	+ voiced	- voiced
+ labial	+ velar	+ labial	+ velar
+ stop	+ stop	+ stop	+ stop

► <u>voicing</u> is known about separately to the other features

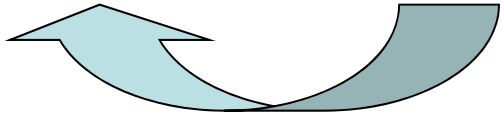
Example 3

Intended	*Actually produced*
Cedars of Lebanon	**Cedars of Lemmanon**

Example 3

Intended	*Actually produced*
Cedars of Lebanon	**Cedars of Lemmanon**

+ voiced	+ voiced	+ voiced	+ voiced
+ labial	+ alveolar	+ labial	+ alveolar
+ stop	+ nasal	+ nasal	+ nasal



► nasal is known about separately to the other features

So...

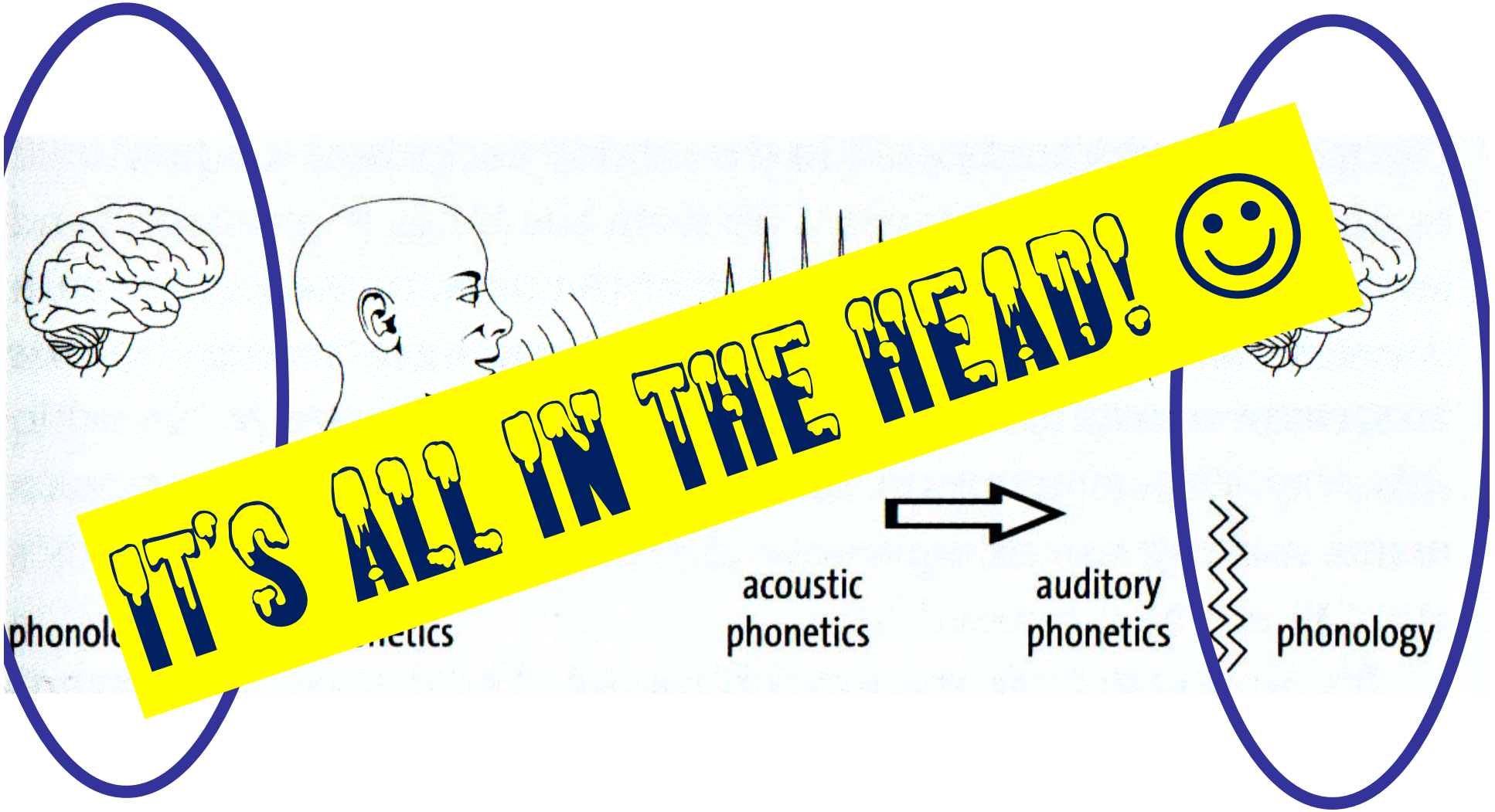
- the brain does seem to organise things using phonetic features...
- what does it base recognising these features on?
  - energy/frequency
  - visual information on articulation
  - linguistic context!

McGurk Effect

http://ramil.sagum.net/stuff/mcgurk_medium.avi

Did you hear…

- [b]
- [d]
- [g]
- something else?



Introduction to English Linguistics
(Bieswanger / Becker)

Fig. 3.2
The speech chain

Phonetics and Phonology

Phonetics & Phonology

- Phonetics
  - is about the **actual sounds** that are made in language and languages

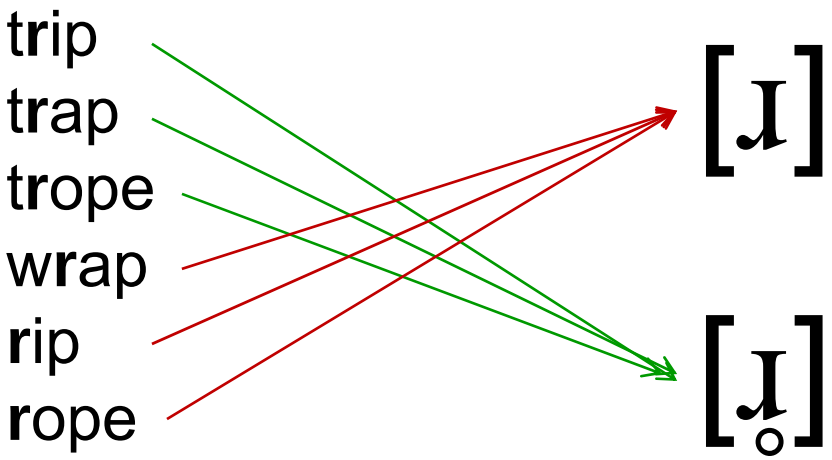
- Phonology
  - is about how languages **divide up** the individual sounds into units for making distinct meaning-carrying elements (words and morphemes)

“Phonology”

- the **function** of sounds

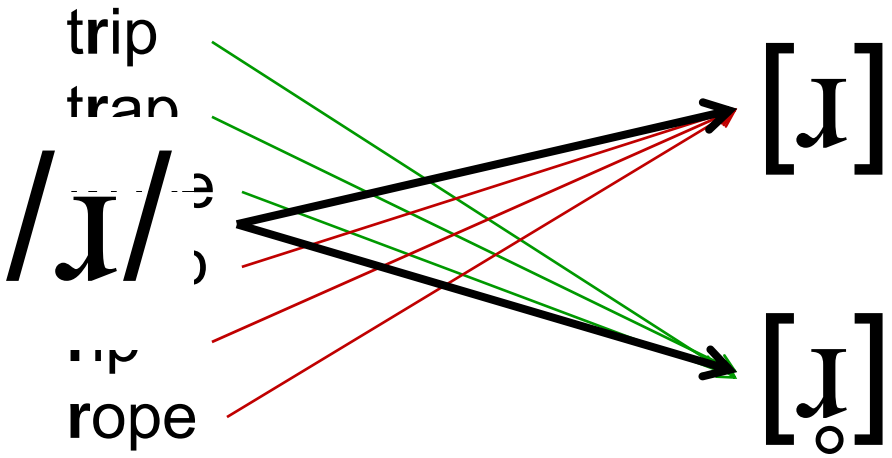
Phonology

- groups bundles of physical stimuli (corresponding to phonetic information) into ‘abstract sounds’ that speakers ‘hear’ as the same...



Phonology

- groups bundles of physical stimuli (corresponding to phonetic information) into ‘abstract sounds’ that speakers ‘hear’ as the same...



Phonology

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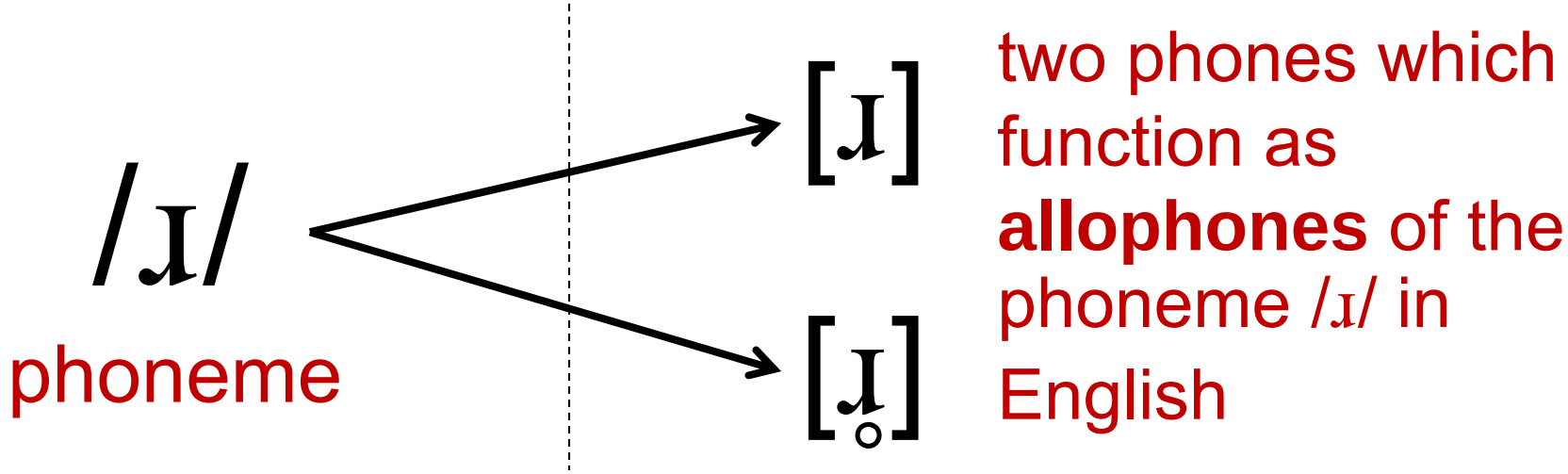
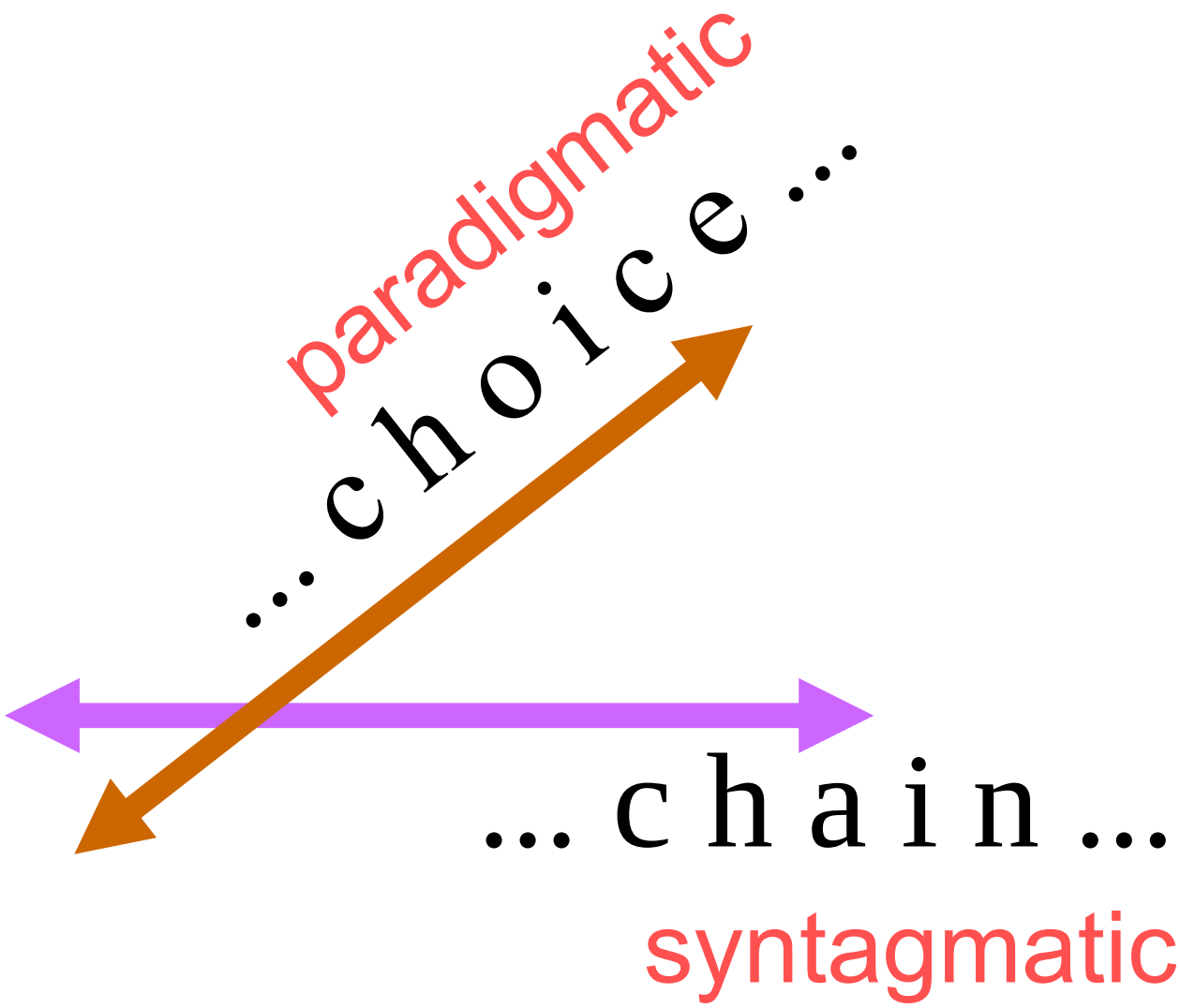


- How do we find out which are the phonemes of a language???

Paradigmatic vs. Syntagmatic

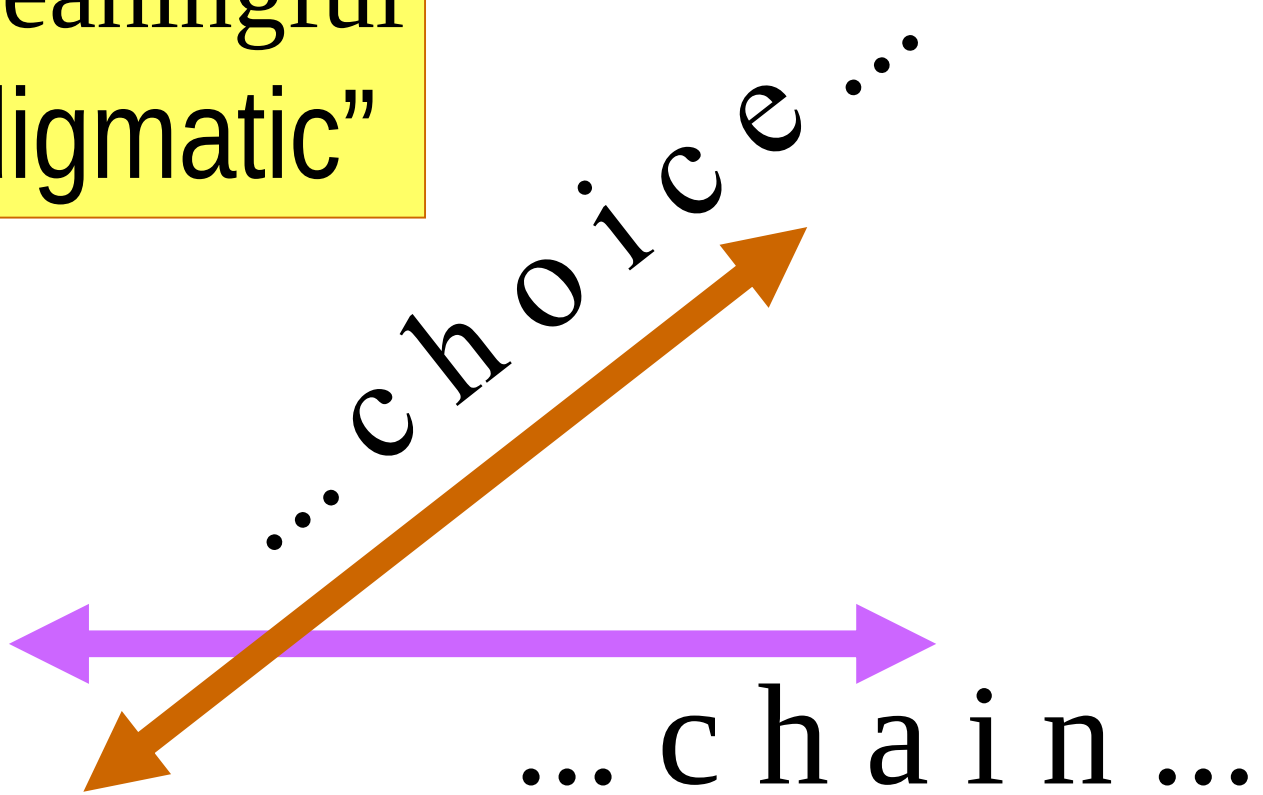
Ferdinand de Saussure

(1916)

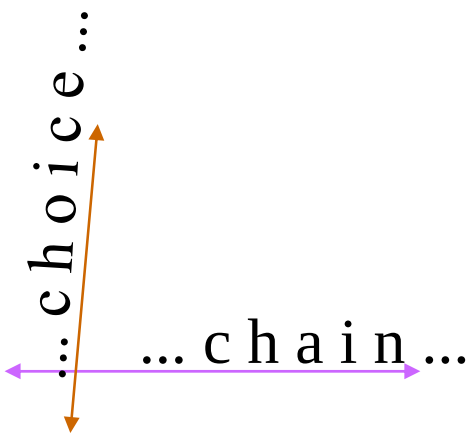

paradigmatic
... c h o i c e ...
... c h a i n ...
syntagmatic

choice is meaningful

“paradigmatic”



“syntagmatic”

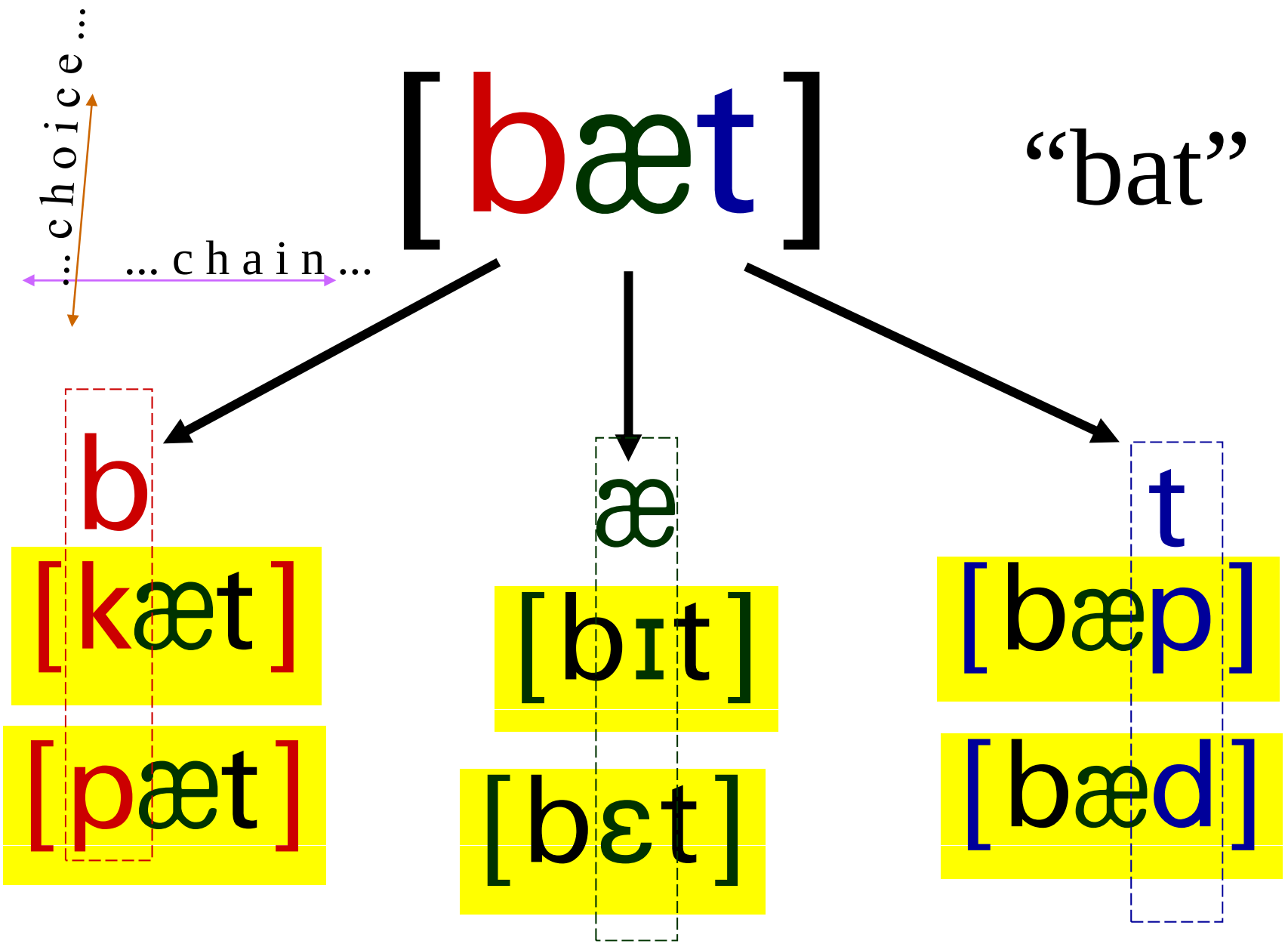


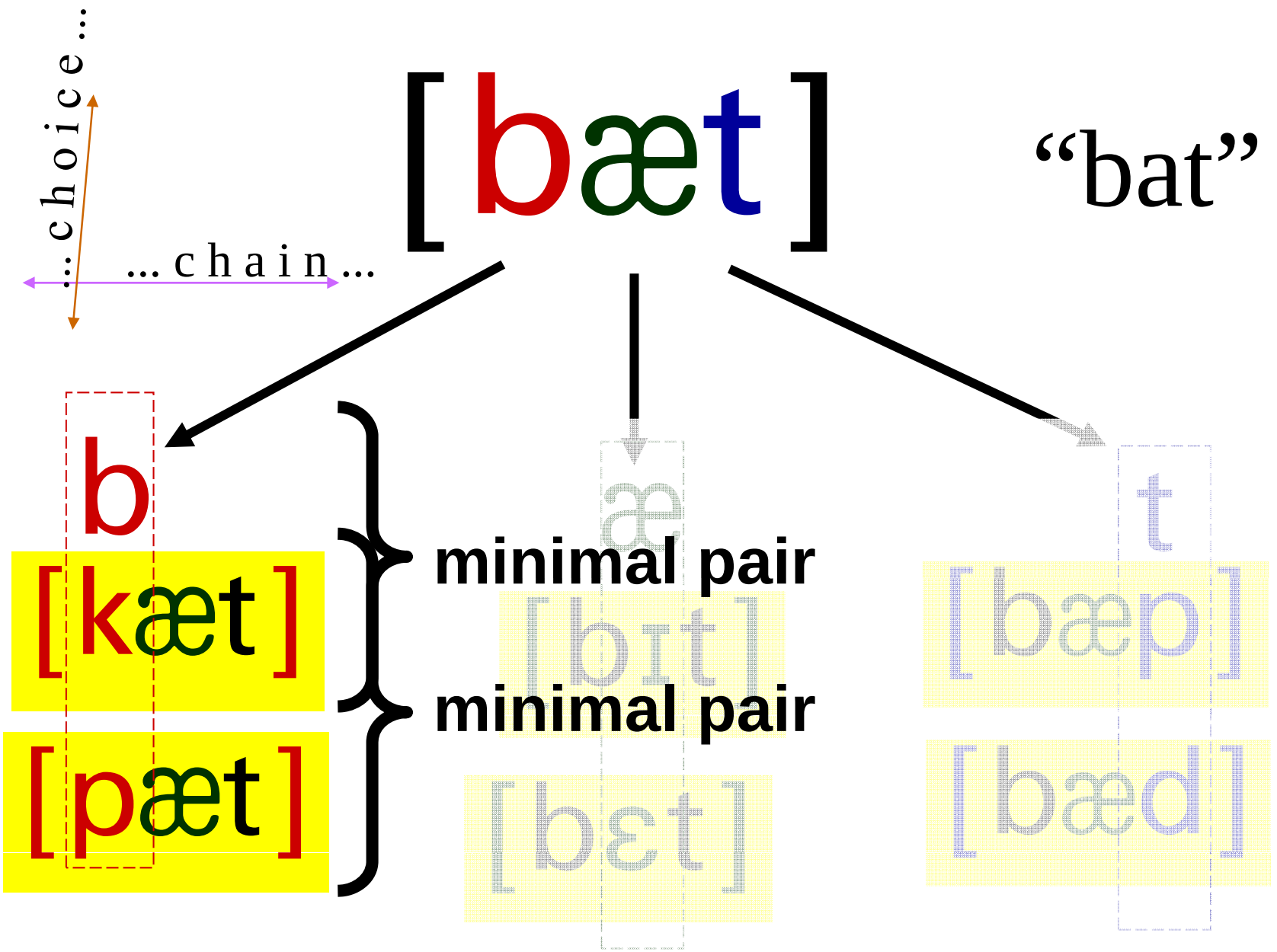
[bæt]

"bat"

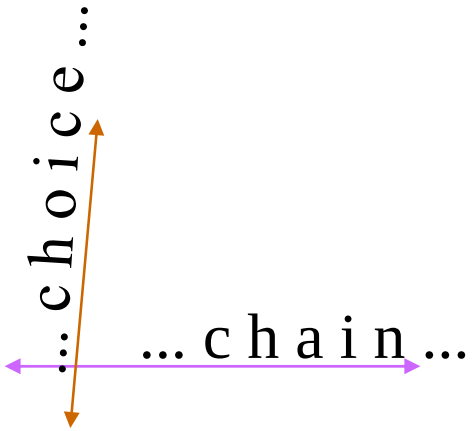
phonetics

a chain of **phones**


...choice...
...chain...
[bæt]
"bat"
b
æ
t
[kæt]
[pæt]
[bɪt]
[bɛt]
[bæp]
[bæd]


...choice...
...chain...
[bæt]
"bat"
b
[kæt]
[pæt]
minimal pair
minimal pair
æ
[bɪt]
[bɛt]
t
[bæp]
[bæd]

Phonemes / Phonology: contrastive units

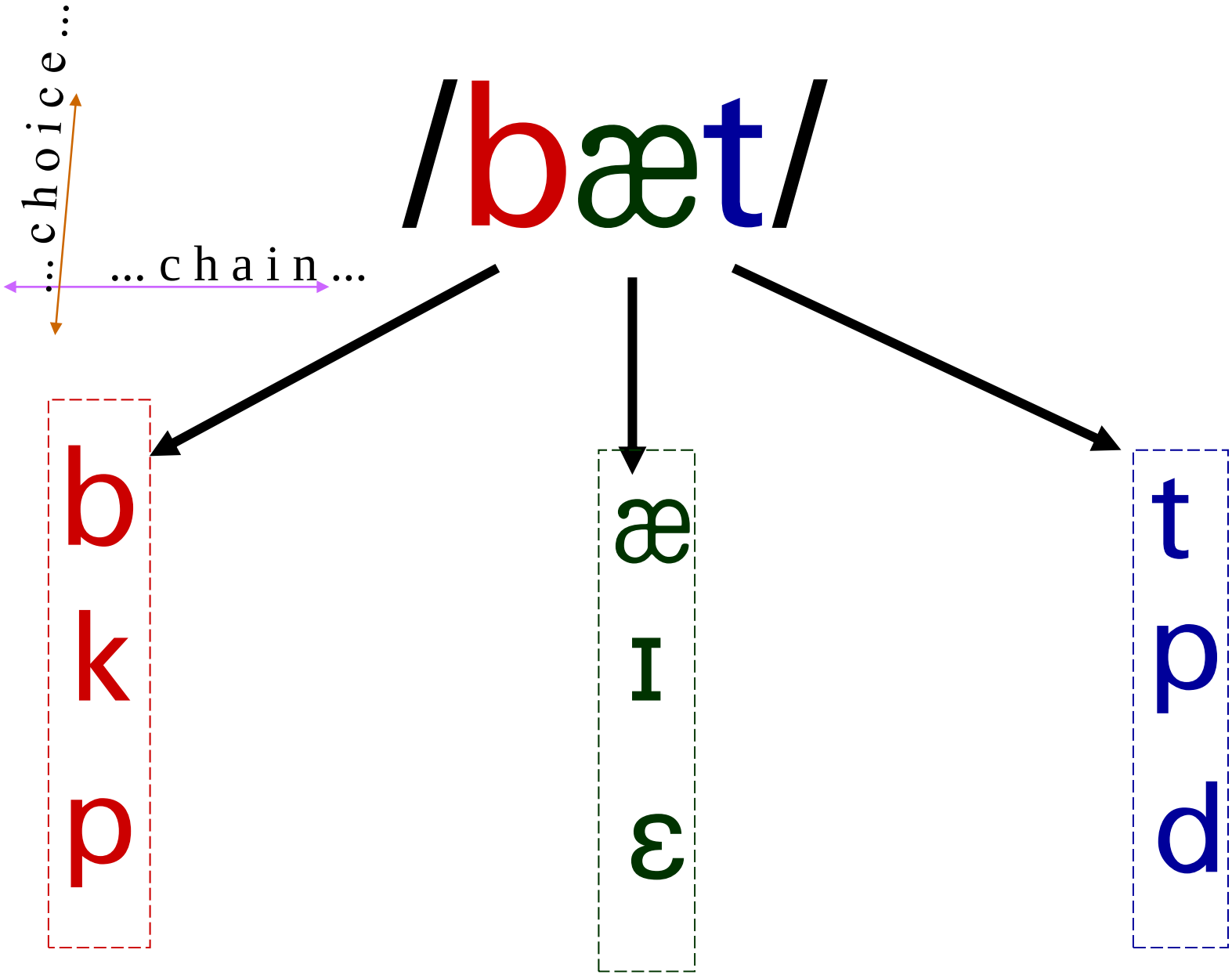


/bæt/

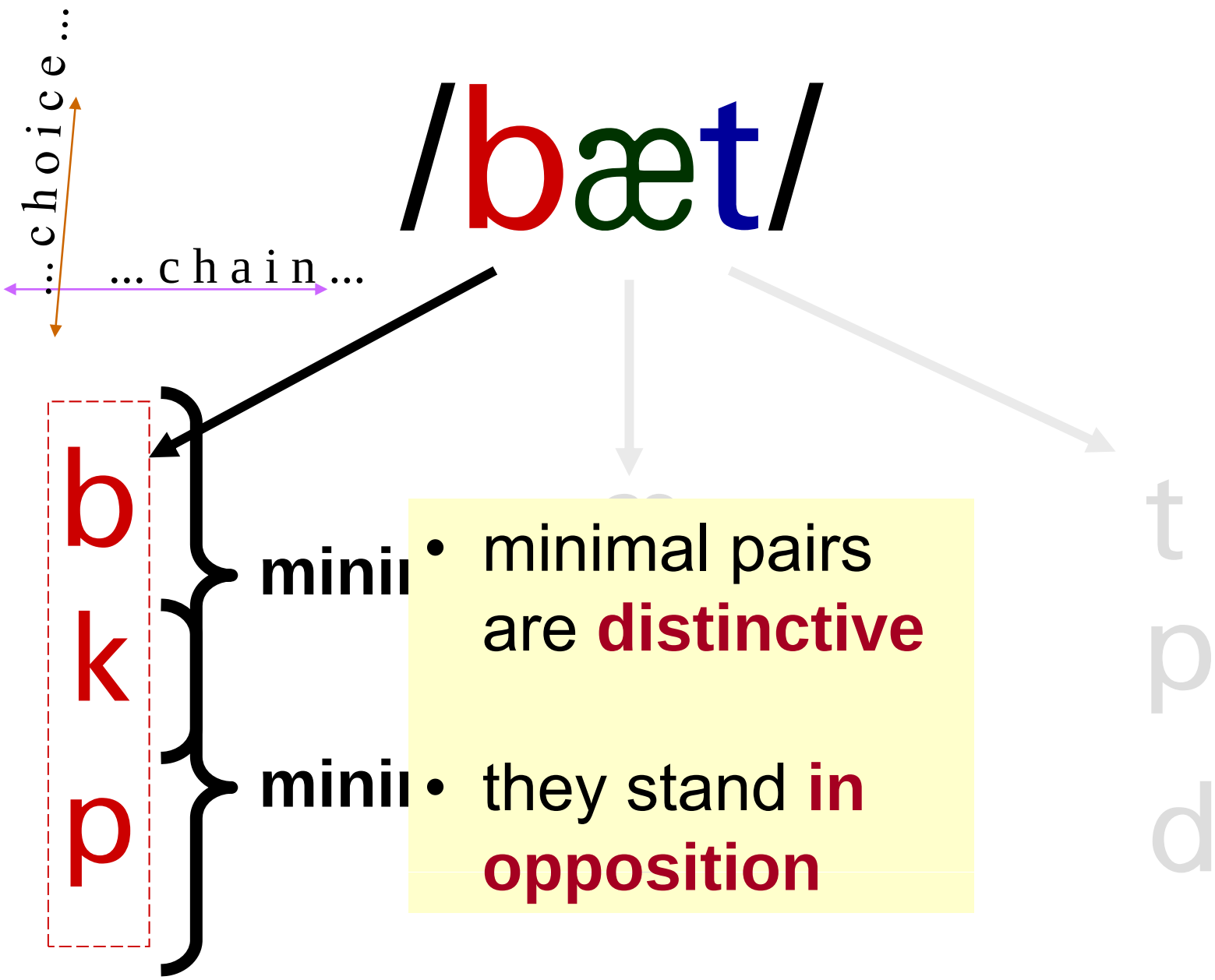
phonology

a chain of **phonemes**

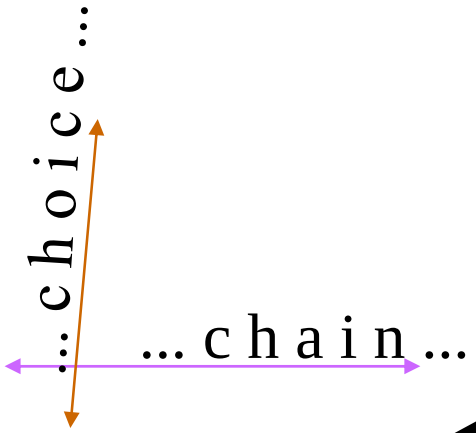
Phonemes / Phonology: contrastive units



Phonemes / Phonology: contrastive units



Phonemes / Phonology: contrastive units

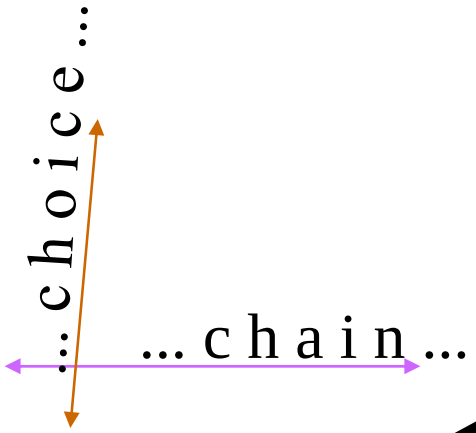


/bæt/

b
k
p

- **phonemes are the minimal units of phonology**
- **changing a phoneme means that you change the word!**

Phonemes / Phonology: contrastive units



/bæt/

b
k
p

- and just which units are distinctive depends on the language
- more specifically: on the **phonological system** of the language

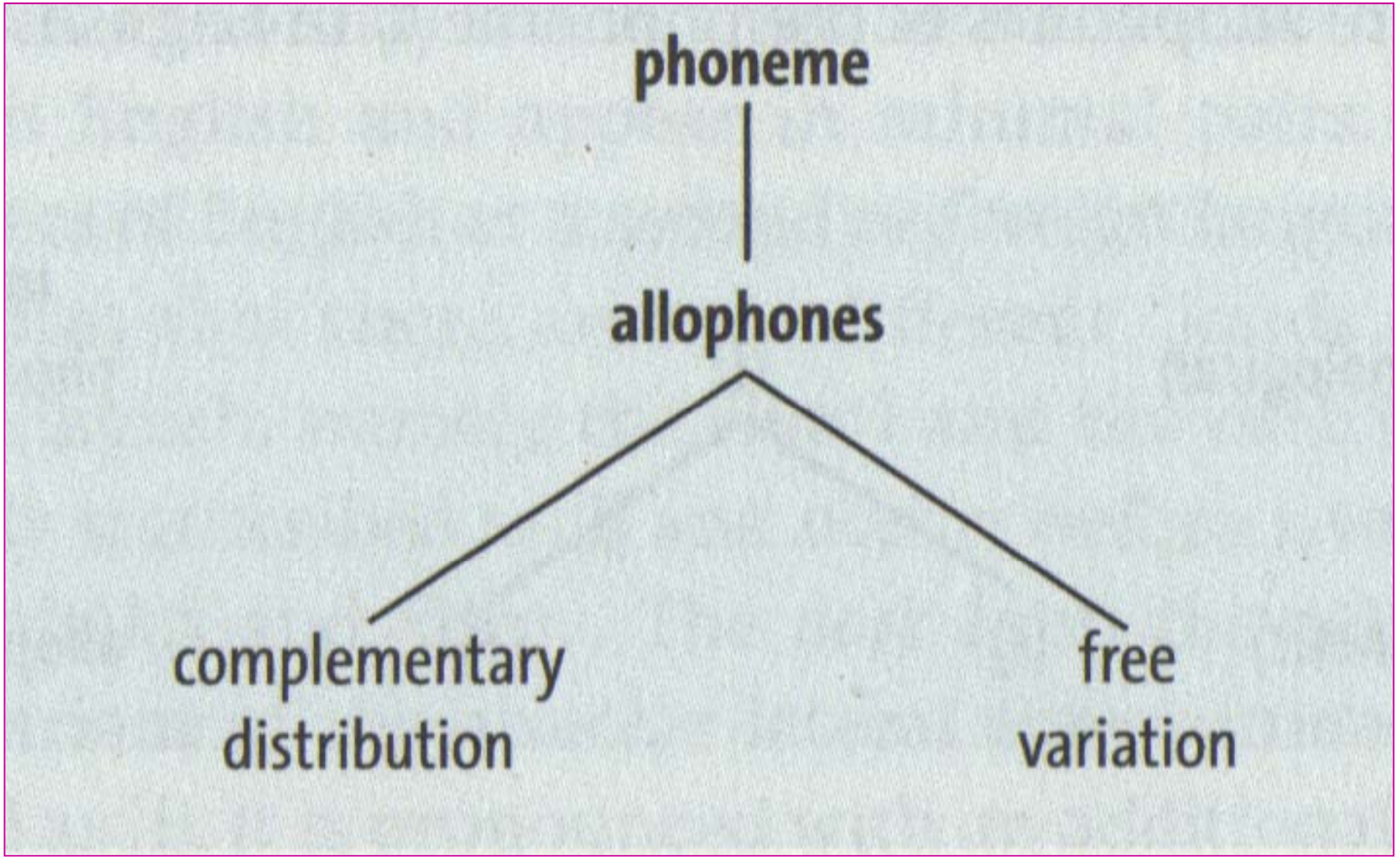


Fig. 3.24

The distribution of allophones

Introduction to English Linguistics
(Bieswanger / Becker)

Grouping sounds together

- light
- hell
- milk
- leopard
- bold
- late
- leak
- close
- lick
- luck
- tulip
- film

Phonetic representation

light [ɬaɪt]

hell [hɛɬ]

milk [mɪɬk]

leopard [lɛpɹd]

bolt [boʊɬt]

late [ɬeɪt]

leak [lik]

close [kɬoʊz]

lick [lɪk]

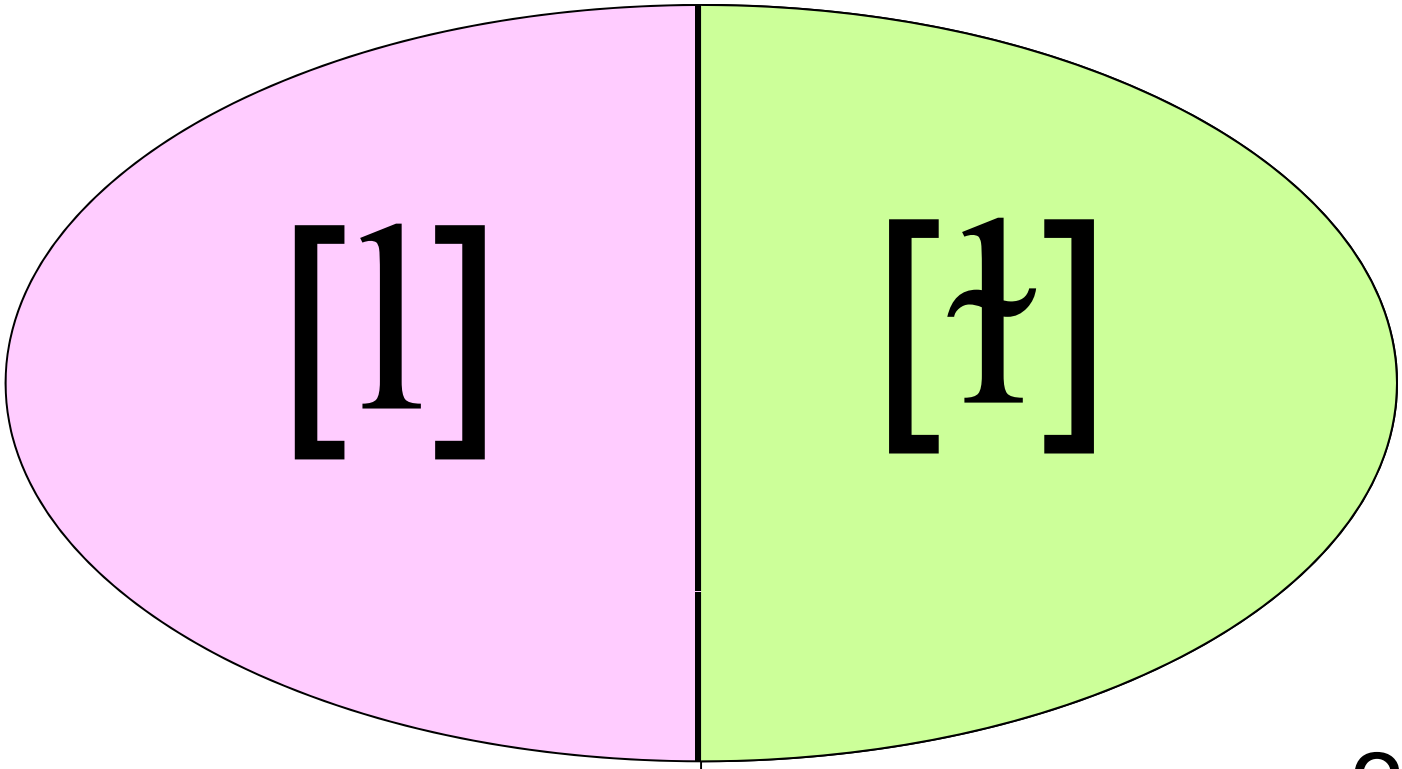
luck [ɬʌk]

tulip [tjulɪp]

film [fɪɬm]

Complementary distribution

l



?

?

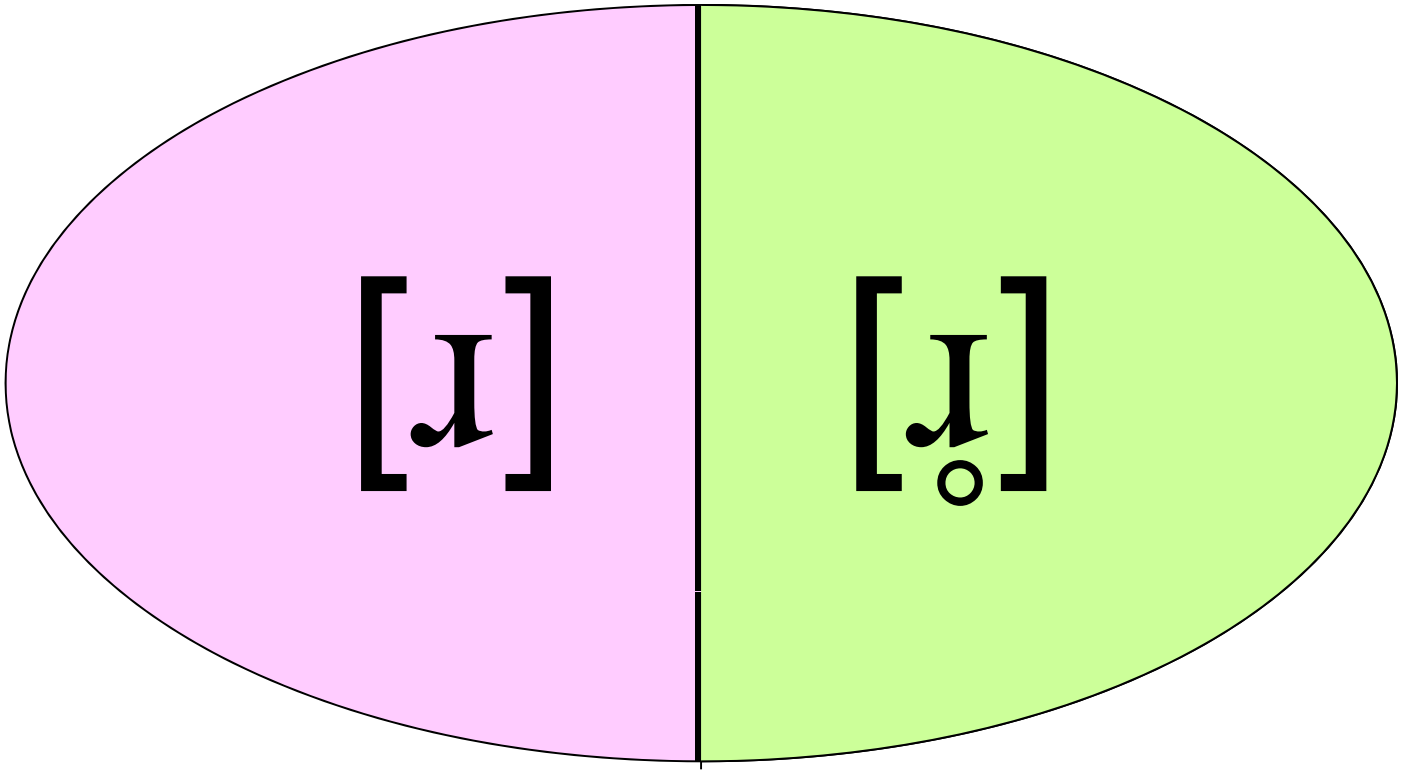
Phonetics & Phonology

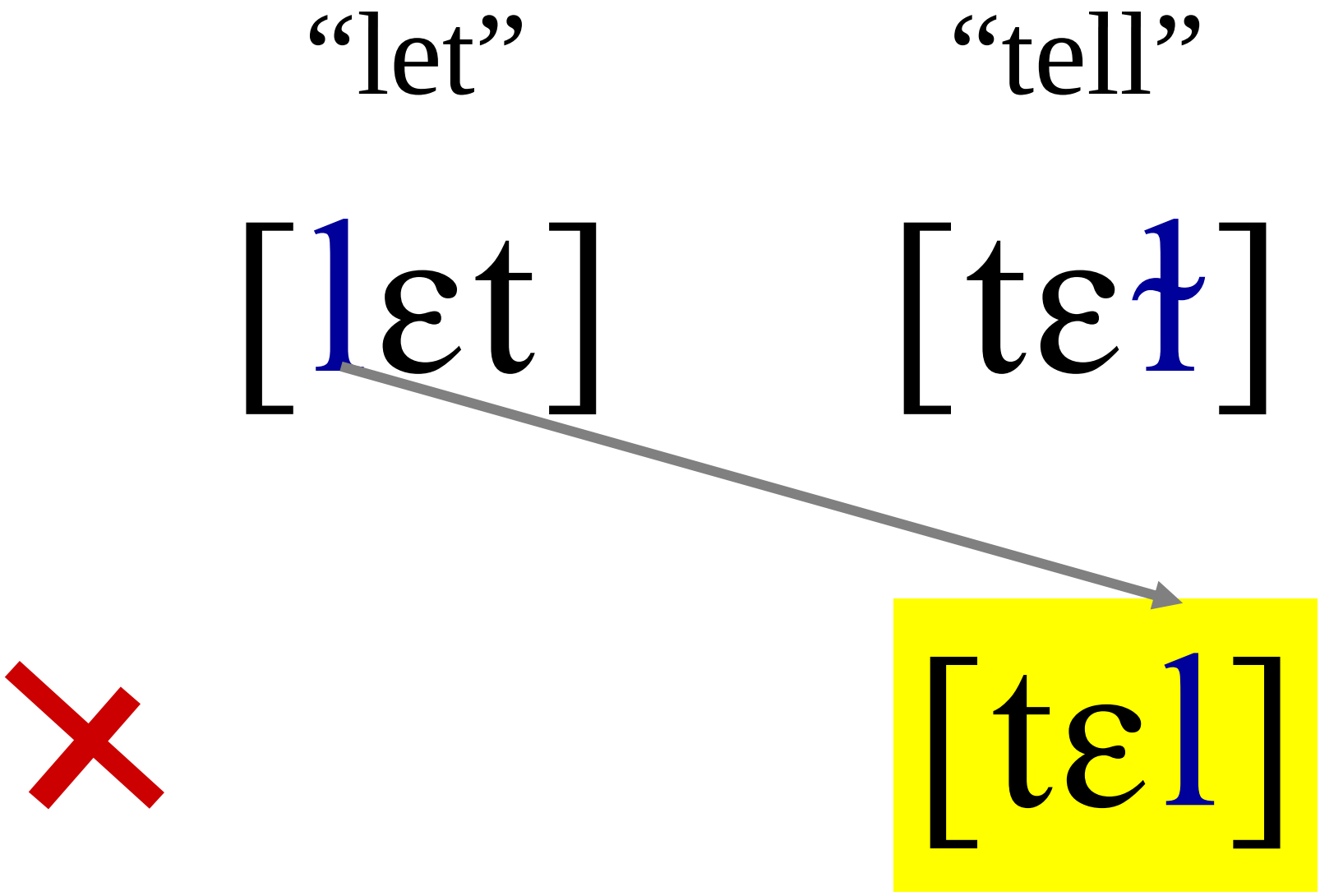
- the actual sounds involved are different
  - [l]
  - [ɬ]

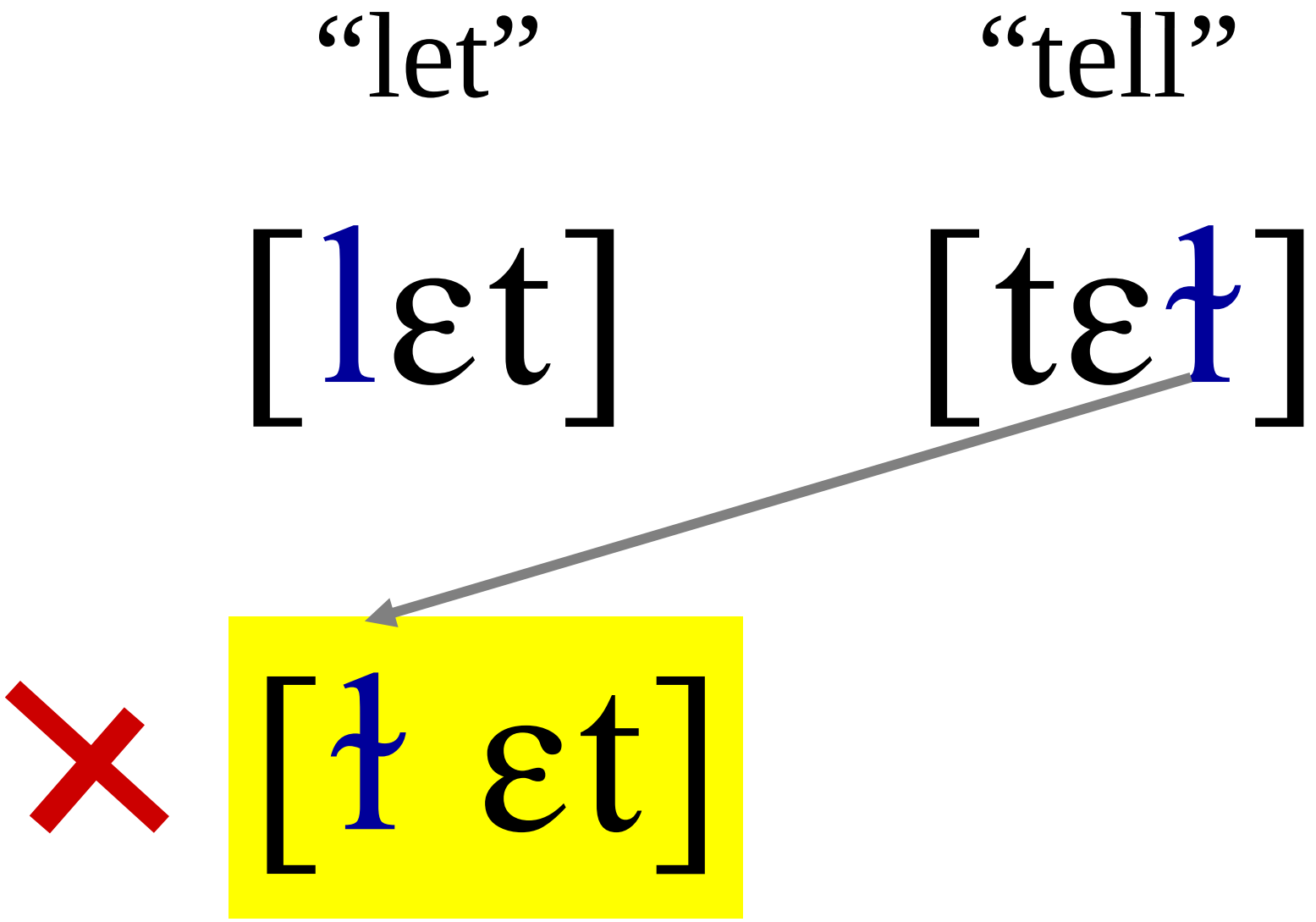
- but English groups these together as a single “abstract sound”, or **phoneme**.

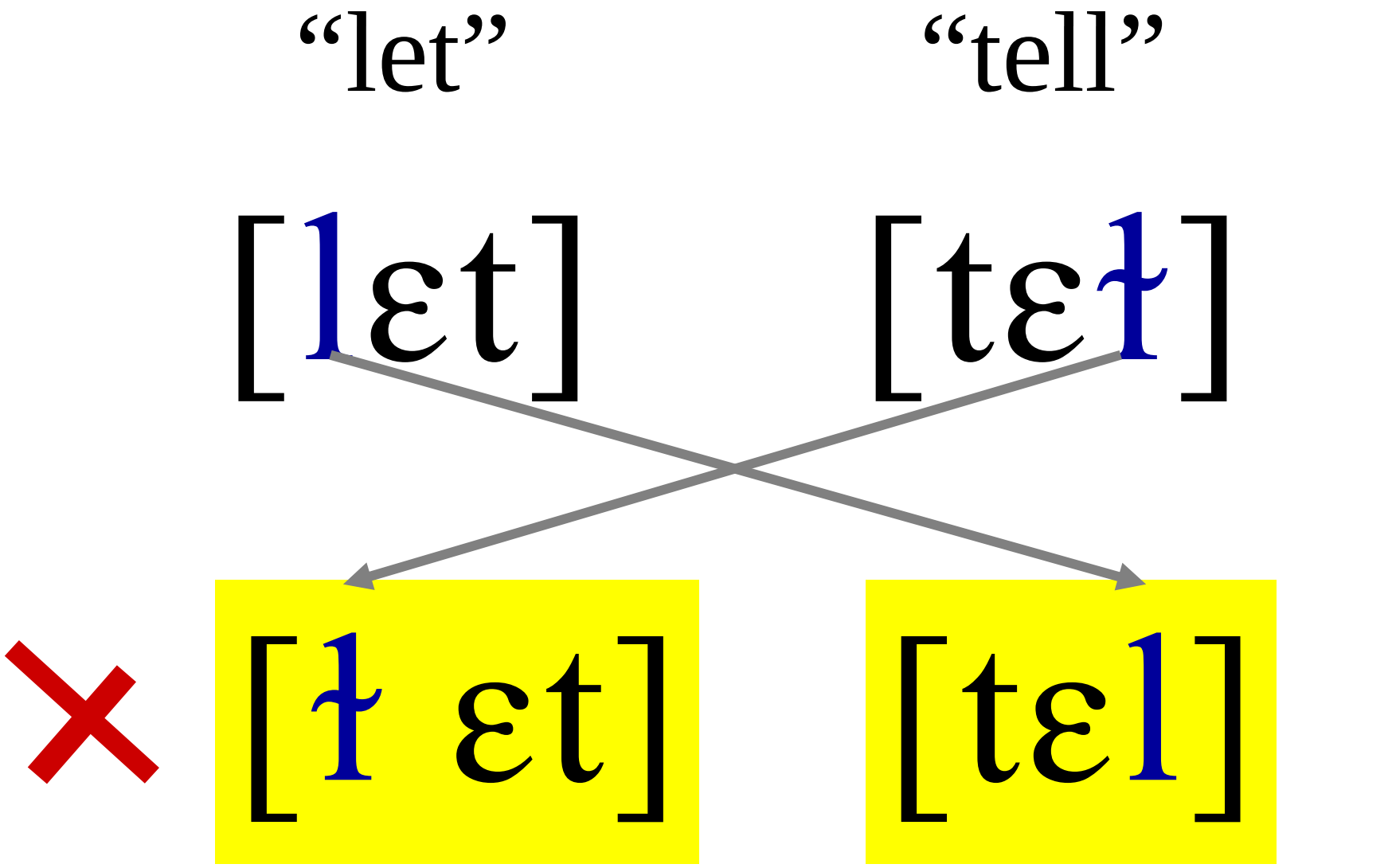
Complementary distribution

/ɹ/




“let”
“tell”
[lɛt]
[tɛɬ]
[tɛl]


“let”
“tell”
[lɛt]
[tɛɬ]
[ɬ ɛt]


“let”
“tell”
[lɛt]
[tɛɬ]
[ɬ ɛt]
[tɛl]
COMPLEMENTARY DISTRIBUTION

Phonetics [lɛt] [tɛɬ]

[l] [ɬ]

phones

Phonetics [lɛt] [tɛɬ]

Phonemics /lɛt/ /tɛl/

‘abstract’ sounds:

the units that a language distinguishes
in order to make up its words

Phonetics [lɛt] [tɛɬ]

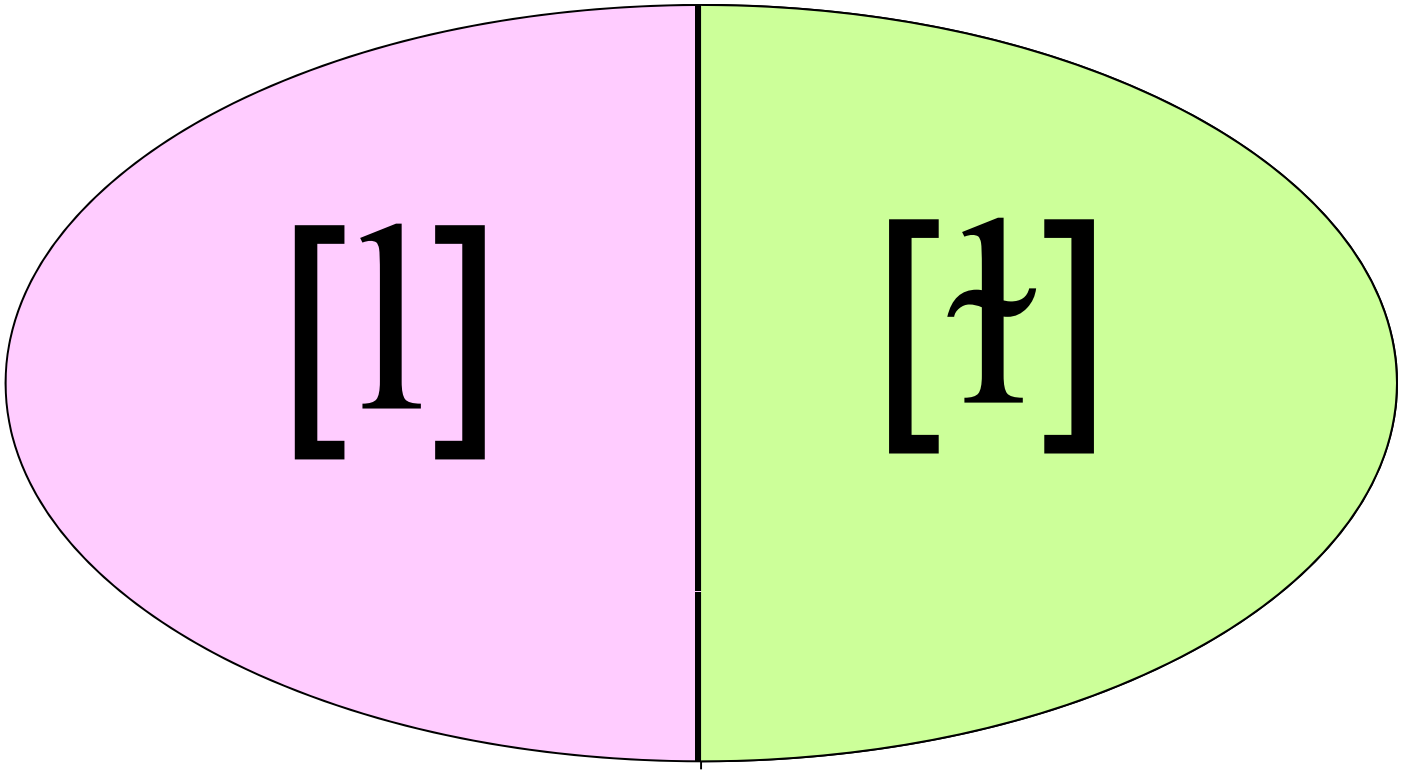
Phonemics /lɛt/ /tɛl/

/l/ → [l] [ɬ]

phoneme phones

Complementary distribution

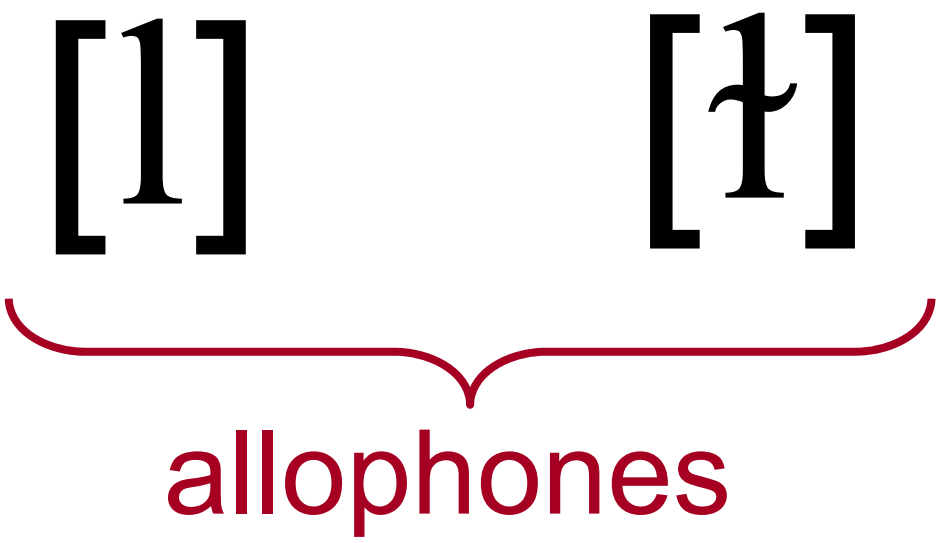
l



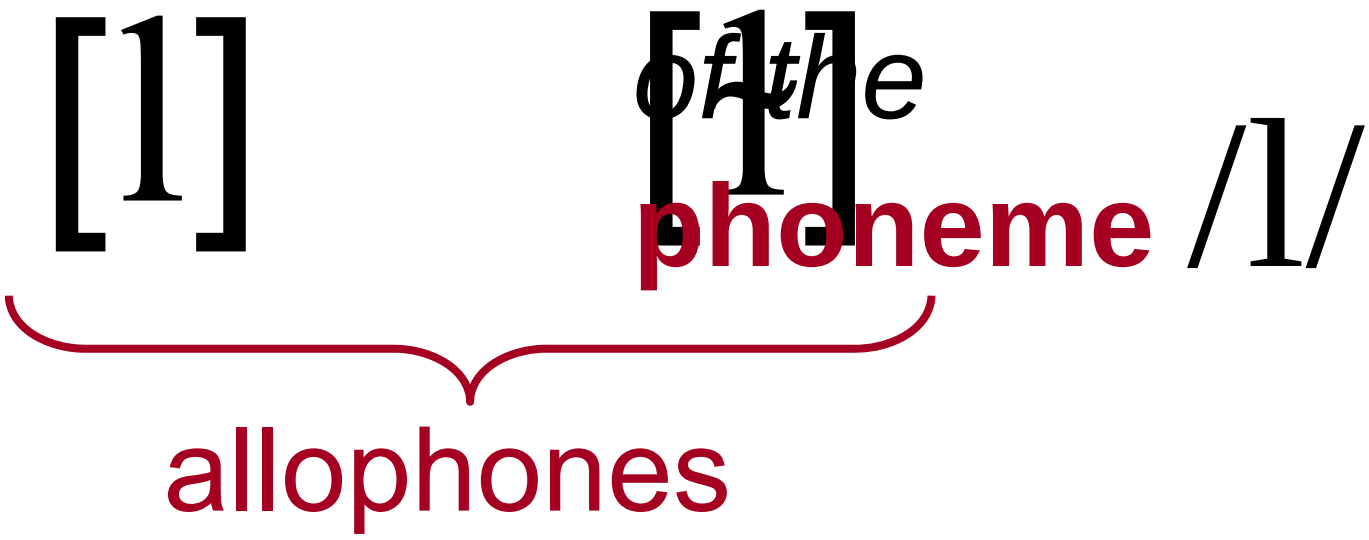
before : ɛ, ɪ, i

elsewhere

Complementary distribution



Complementary distribution



Complementary distribution

[l] [ɬ] *of the* **phoneme** /l/

allophones

when we replace one allophone by another of the same phoneme, we never get a different word

Ways to find out whether we have a different phoneme or just an allophone

- see what happens when we change the form of a word:

  – clap: [klæpˀ] *vs*. [klæp]
  – clapping: *[klæpˀɪŋ] *vs*. [klæpɪŋ]

  – Rad: [ʁaːt] *vs.* Räder: [ʁɛːdɐ]
  – Rat: [ʁaːt] *vs.* Räte: [ʁɛːdə]

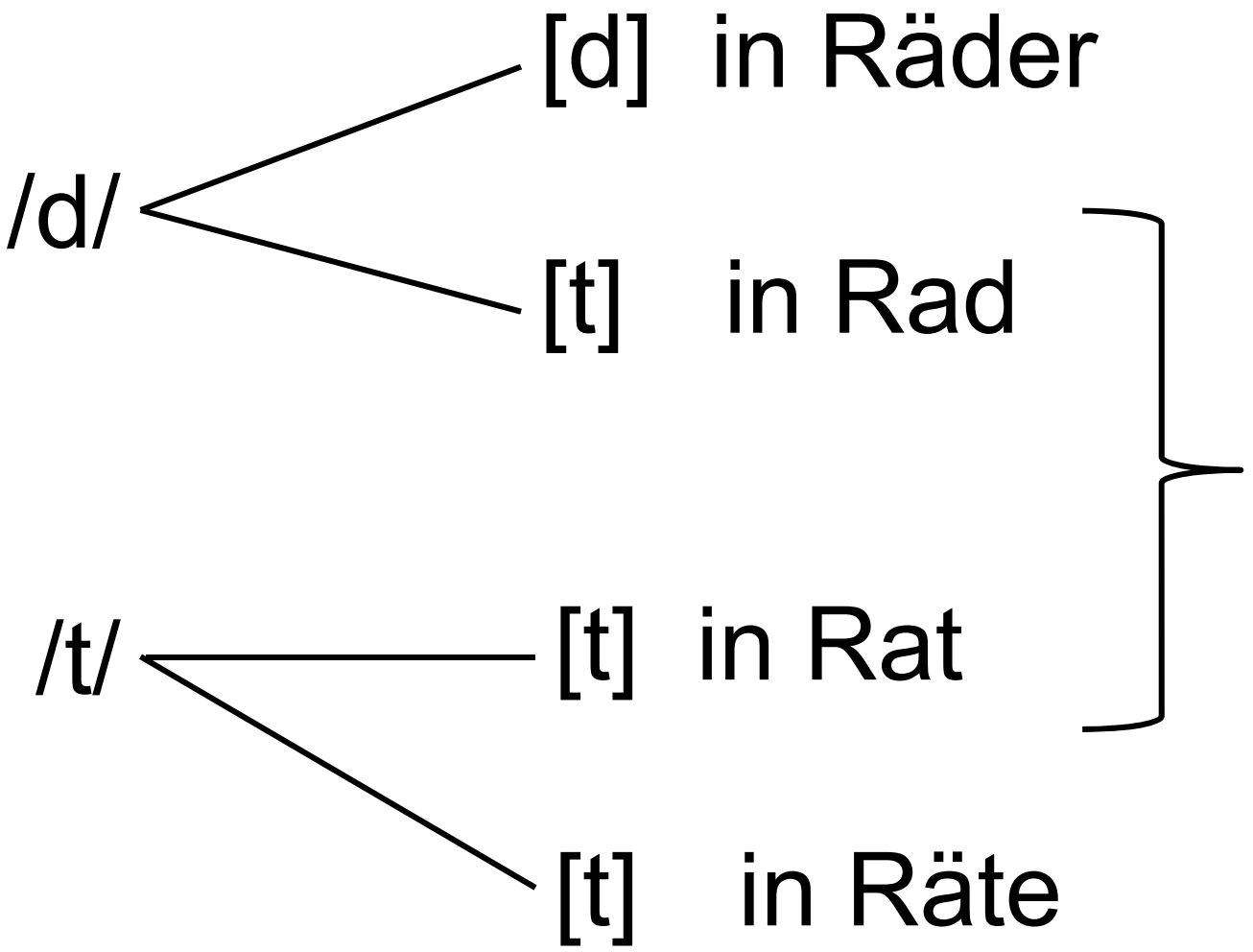
Ways to find out whether we have a different phoneme or just an allophone

- see what happens when we change the form of a word:

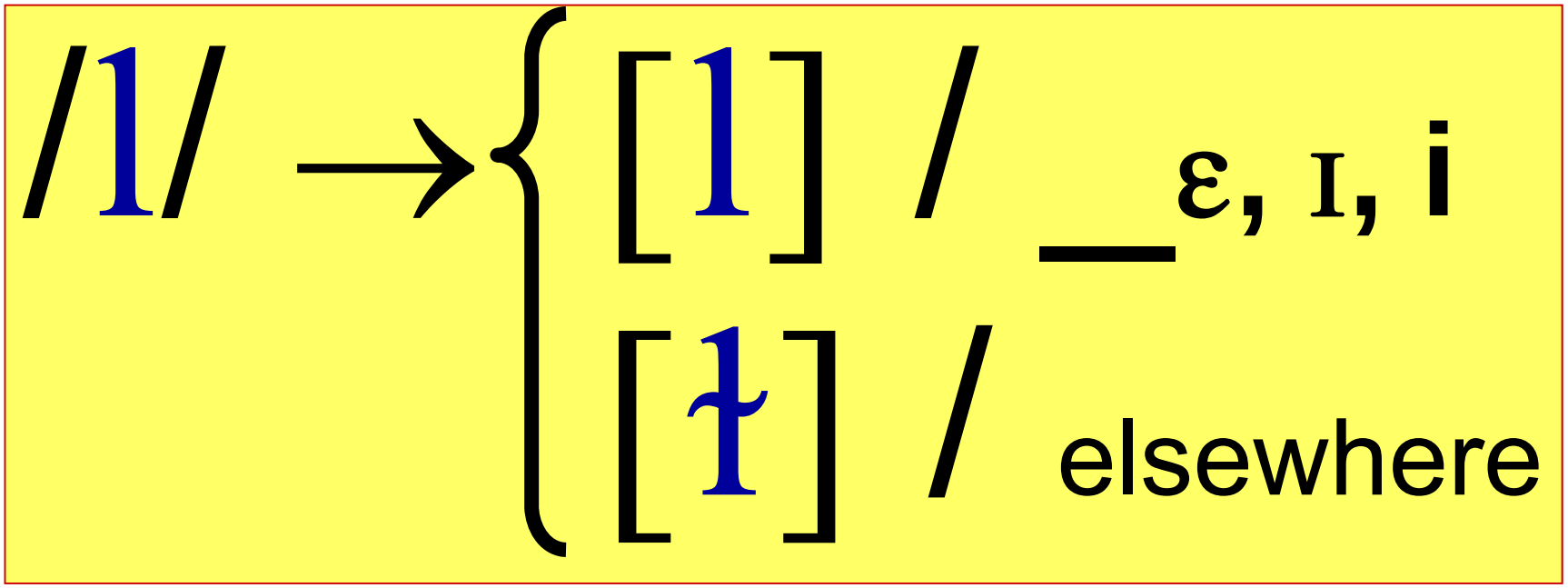
  – tell: [teɬ] *vs*. *[tel]
  – telling: *[teɬɪŋ] *vs*. [telɪŋ]

  – hear: [hɪə] *vs*. *[hɪɹ]
  – hearing: *[hɪə_ɪŋ] *vs*. [hɪɹɪŋ]

Neutralisation of contrasts



Phonological Rule



Making generalisations

i	Pete, beat			u	pool, boot
ɪ	pit, bit			ʊ	put, foot
e	late, bait	ə	*a*bout, sof*a*	o	poke, boat
ɛ	pet, bet	ʌ	putt, but	ɔ	port, bought
æ	pat, bat	a	park (in Boston)	ɑ	pot, father

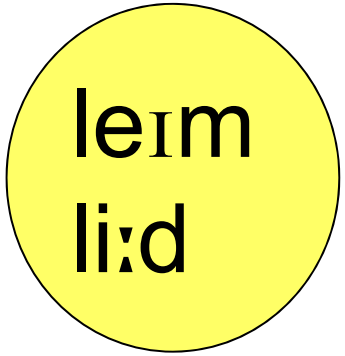
lame leɪm

lead liːd

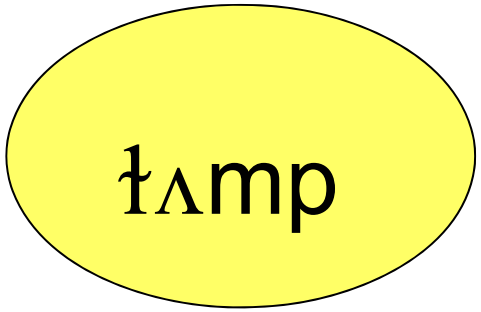
lump ɬʌmp

Making generalisations

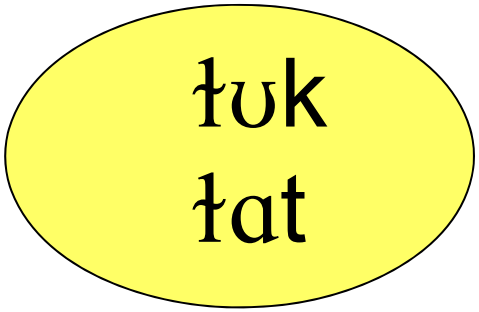
i	Pete, beat			u	pool, boot
ɪ	pit, bit			ʊ	put, foot
e	late, bait	ə	*a*bout, sof*a*	o	poke, boat
ɛ	pet, bet	ʌ	putt, but	ɔ	port, bought
æ	pat, bat	a	park (in Boston)	ɑ	pot, father



front

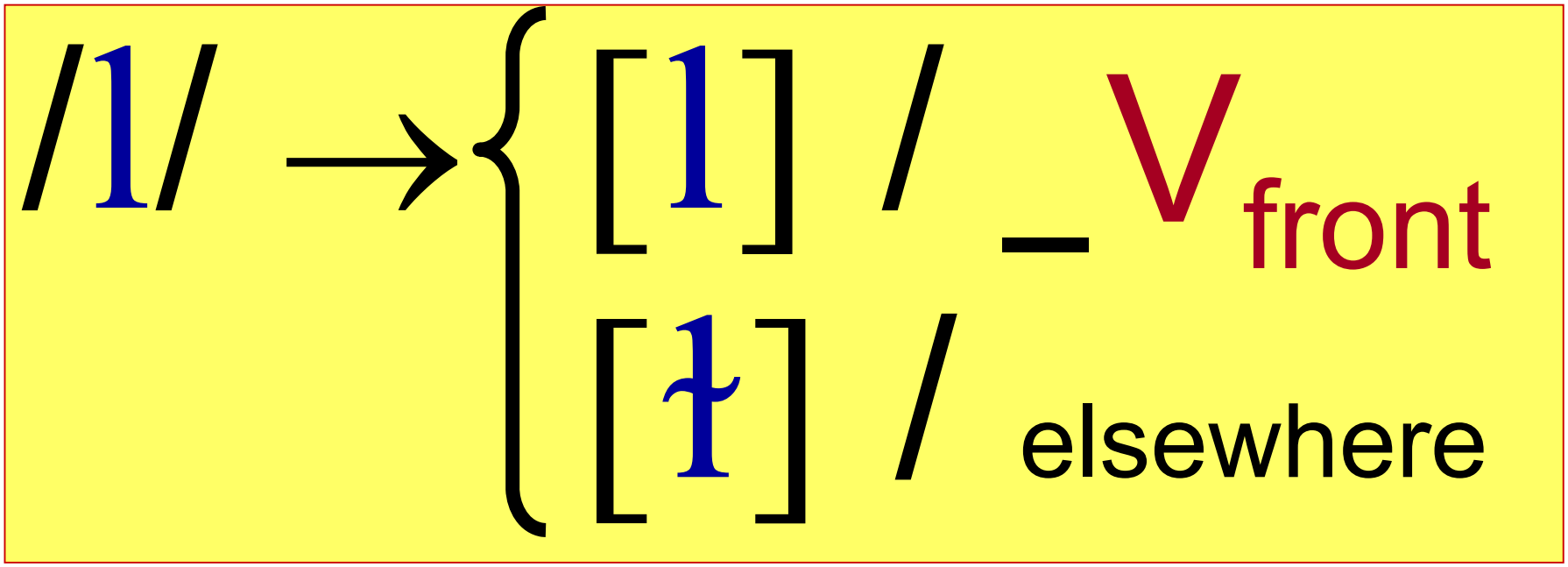


central



back

Phonological Rule
(generalised)



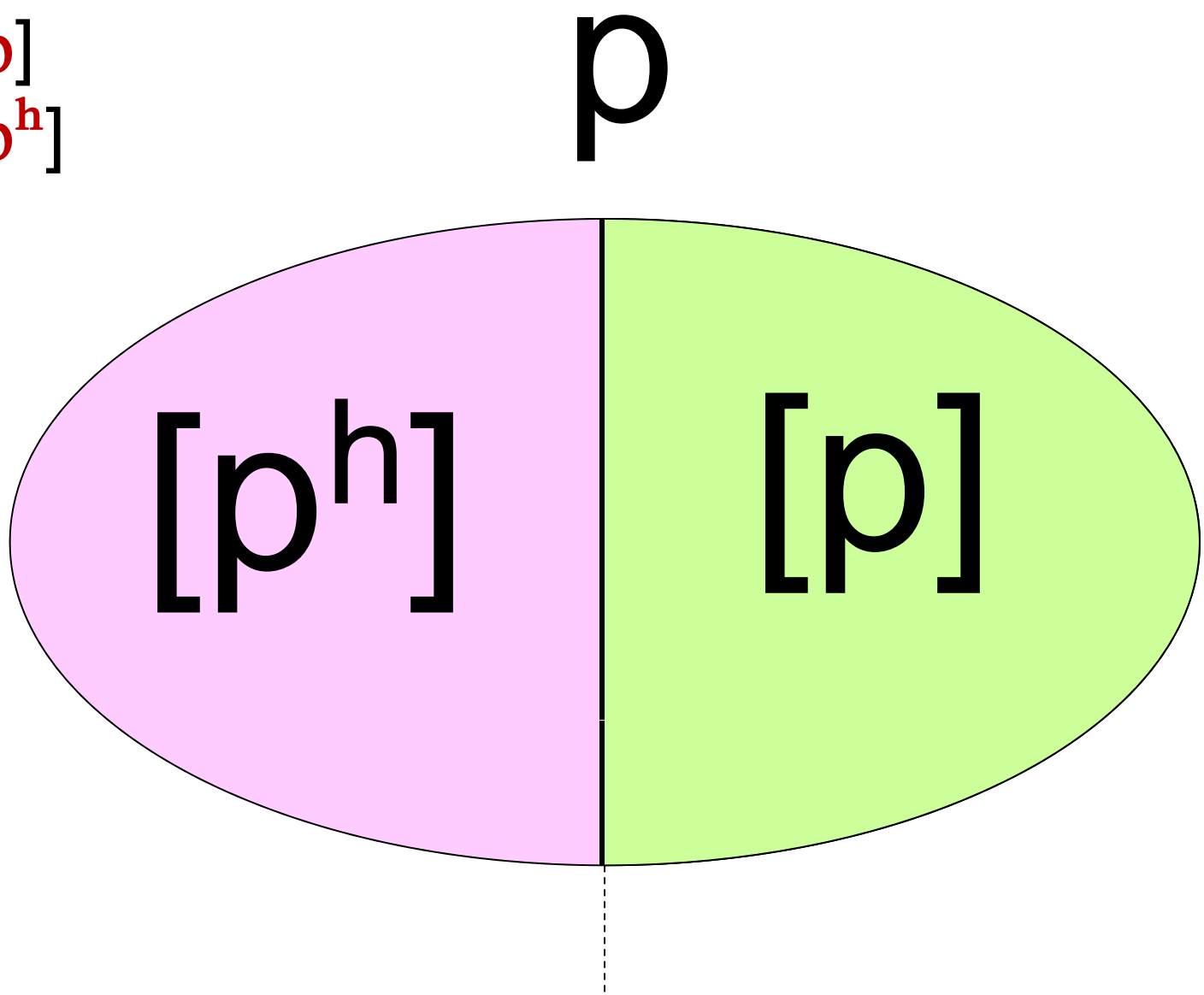
Linguistic features

- We always use linguistic features
  - phonetic features
  - syntactic features
  - phonological features
  - morphological features

  to make **generalisations**

Free variation?

[klæp˺]
[klæp]
[klæpʰ]

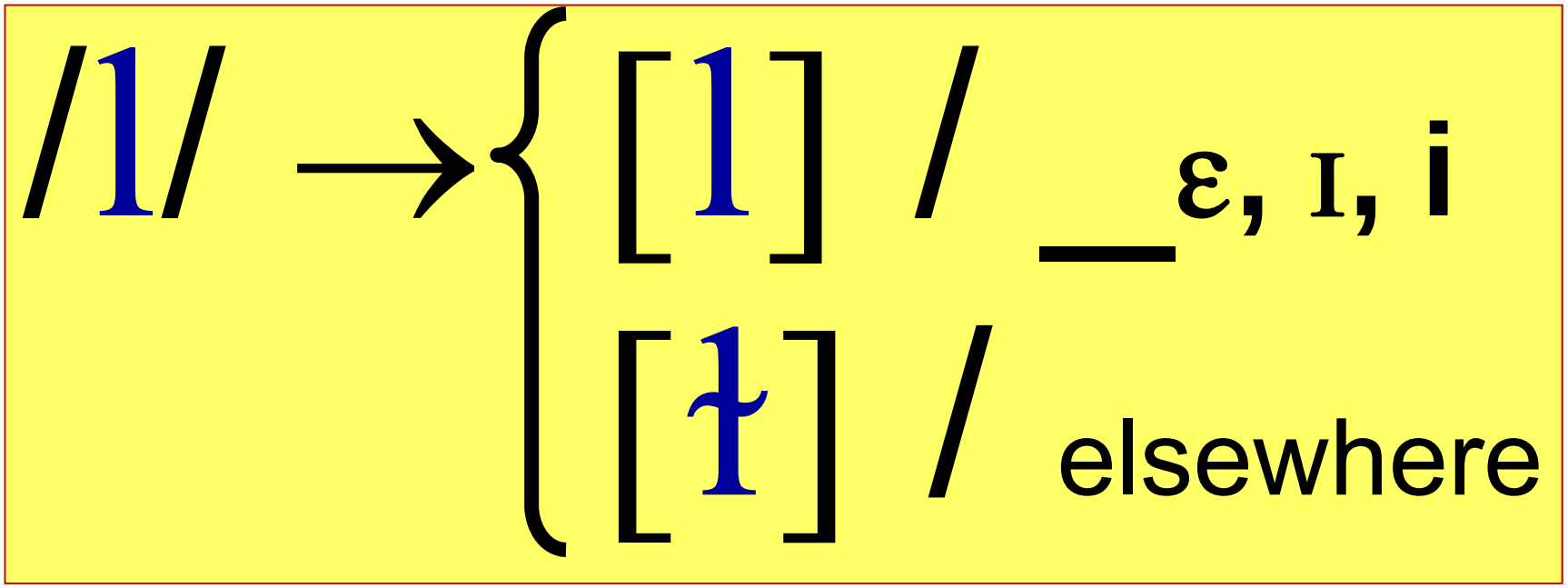


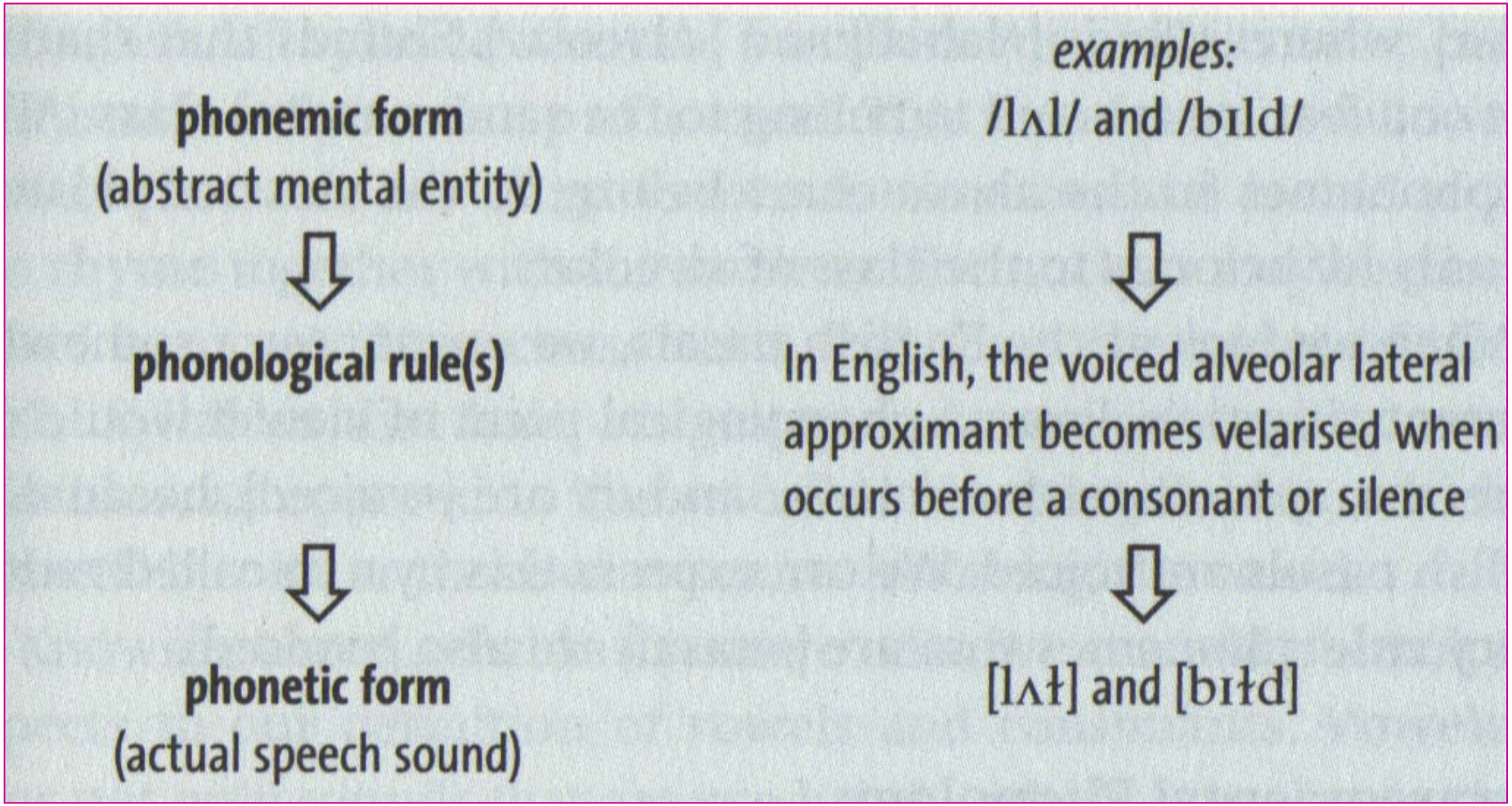
Description vs. Prescription

- Description
  - describing how language **is**, systematising our observations in order to serve as a basis for proposing theories.
  - **Empirical**.

- Proscription / Prescription
  - saying how language **should be**, based on norms and social standards, sense(s) of aesthetics, 'folk'-feelings about language.
  - **Not linguistic!**

Phonological Rule





Introduction to English Linguistics
(Bieswanger / Becker)

Fig. 3.25

Phonological rules

Phonetics & Phonology

- Phonetics
  - is about the **actual sounds** that are made in language and languages

- Phonology
  - is about how languages **divide up** the individual sounds into units for making distinct meaning-carrying elements (words and morphemes)

Phones, Phonemes, Language

Which phones are allophones of which phonemes **depends on the language!!**

For example:

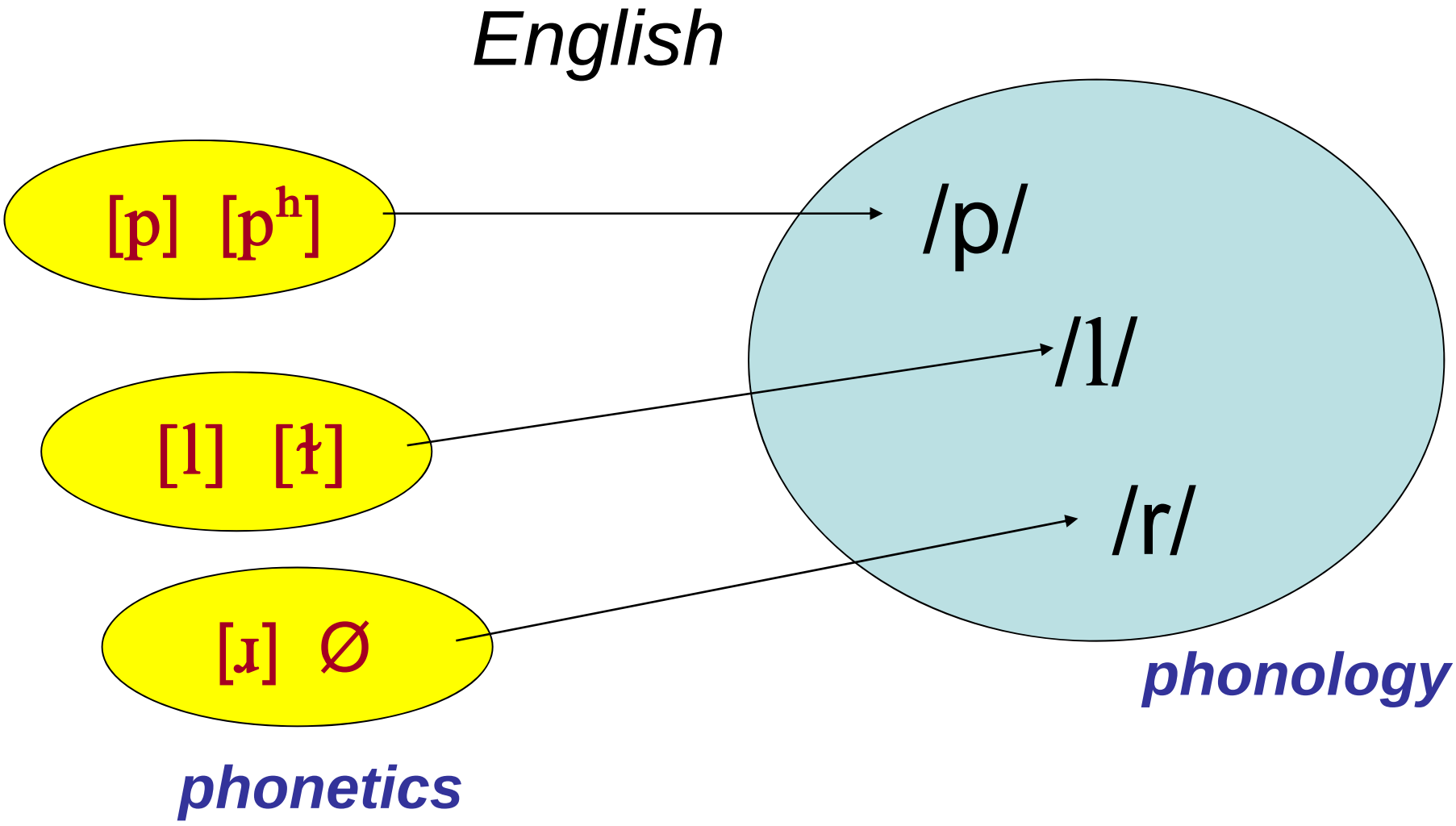
- Chinese / Japanese does not distinguish [l] and [ɹ], some other languages do!
- English does not distinguish [p] and [p^h], some other languages do!

Phones, Phonemes, Language

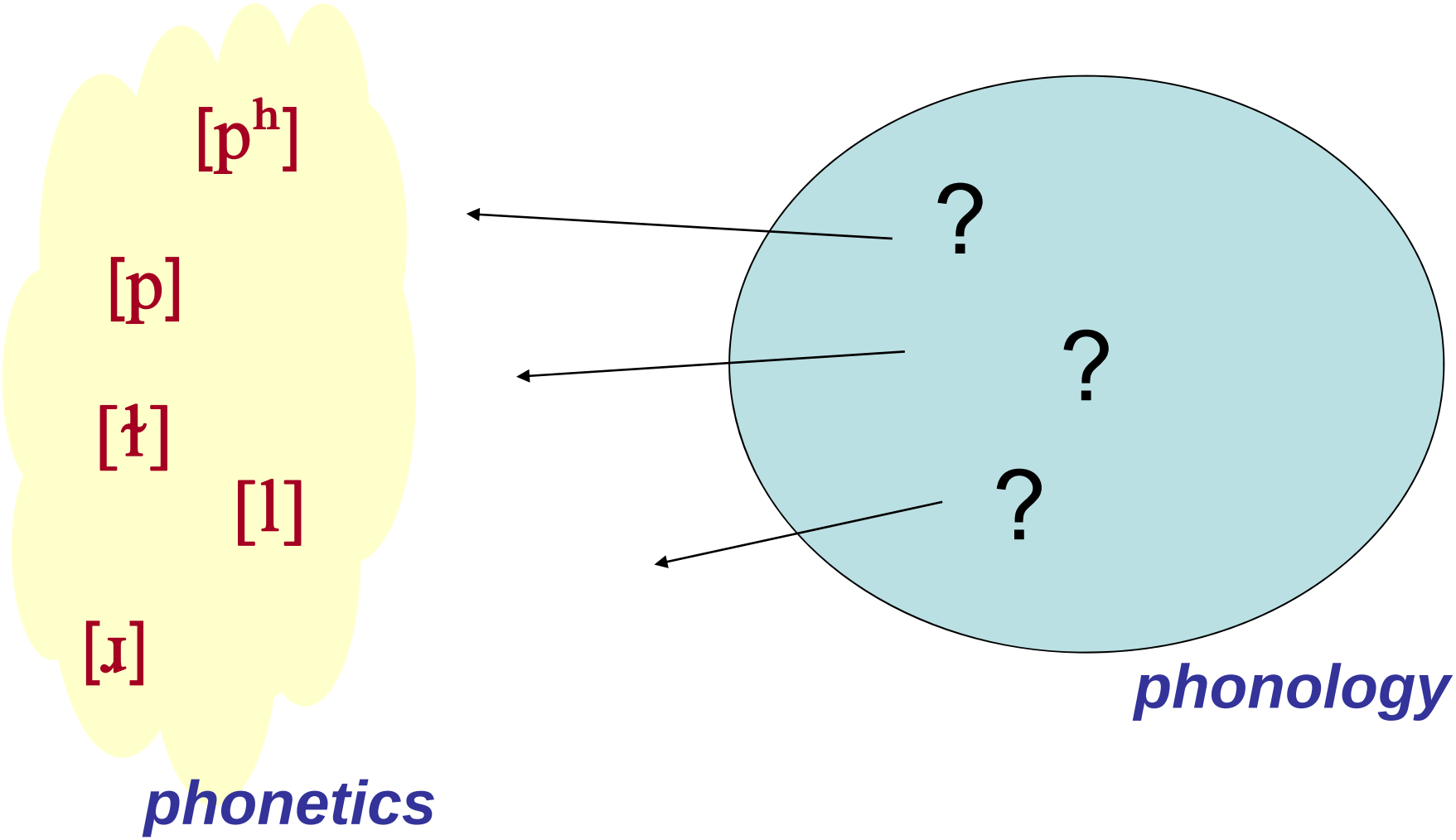
The **phonological system** of a language defines which ‘abstract sounds’ are available to distinguish meanings

It defines ‘abstract sounds’, or **phonemes**, as a collection of actual sounds (phones) that are **not distinguished** by speakers of the language.

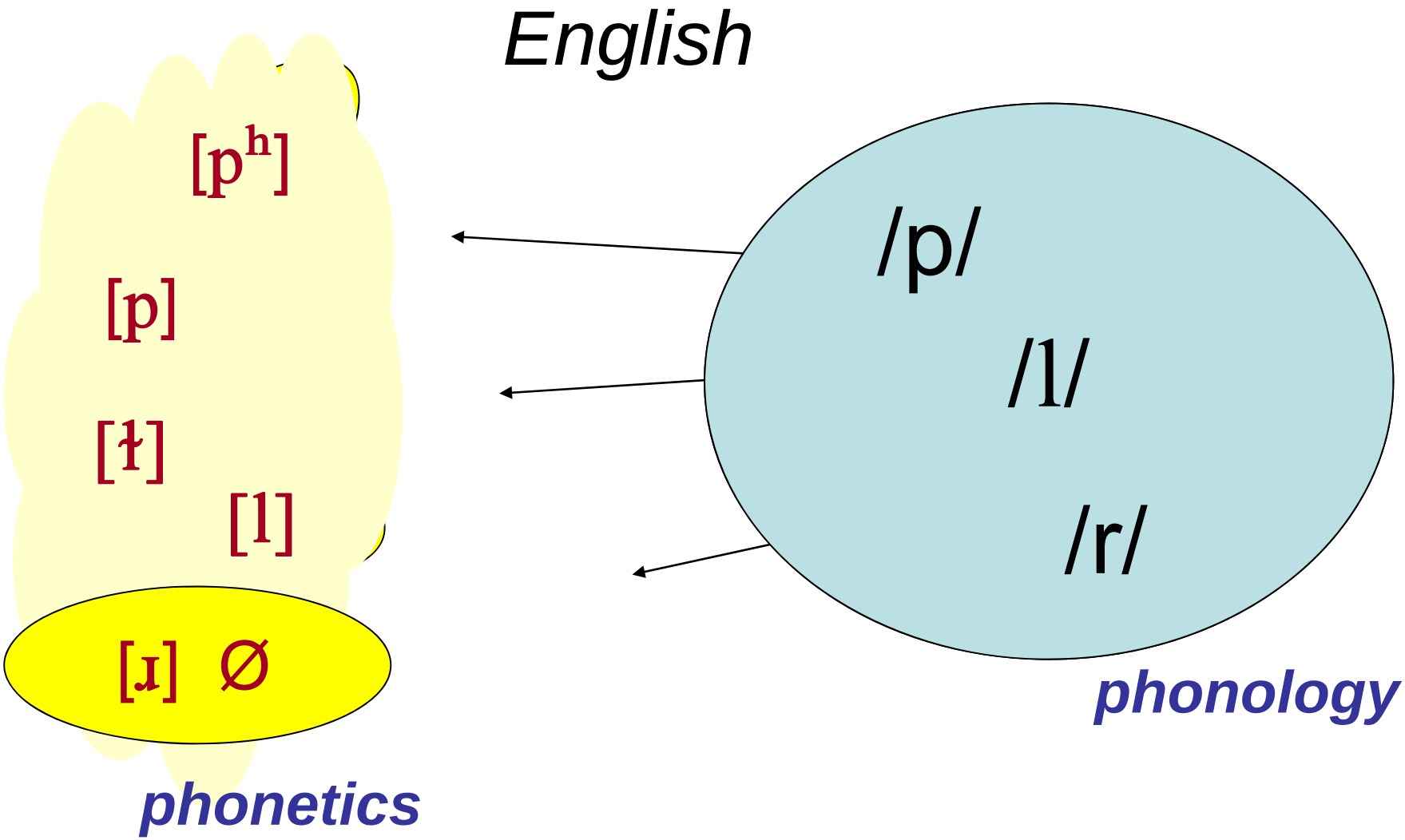
Phones, Phonemes, Language



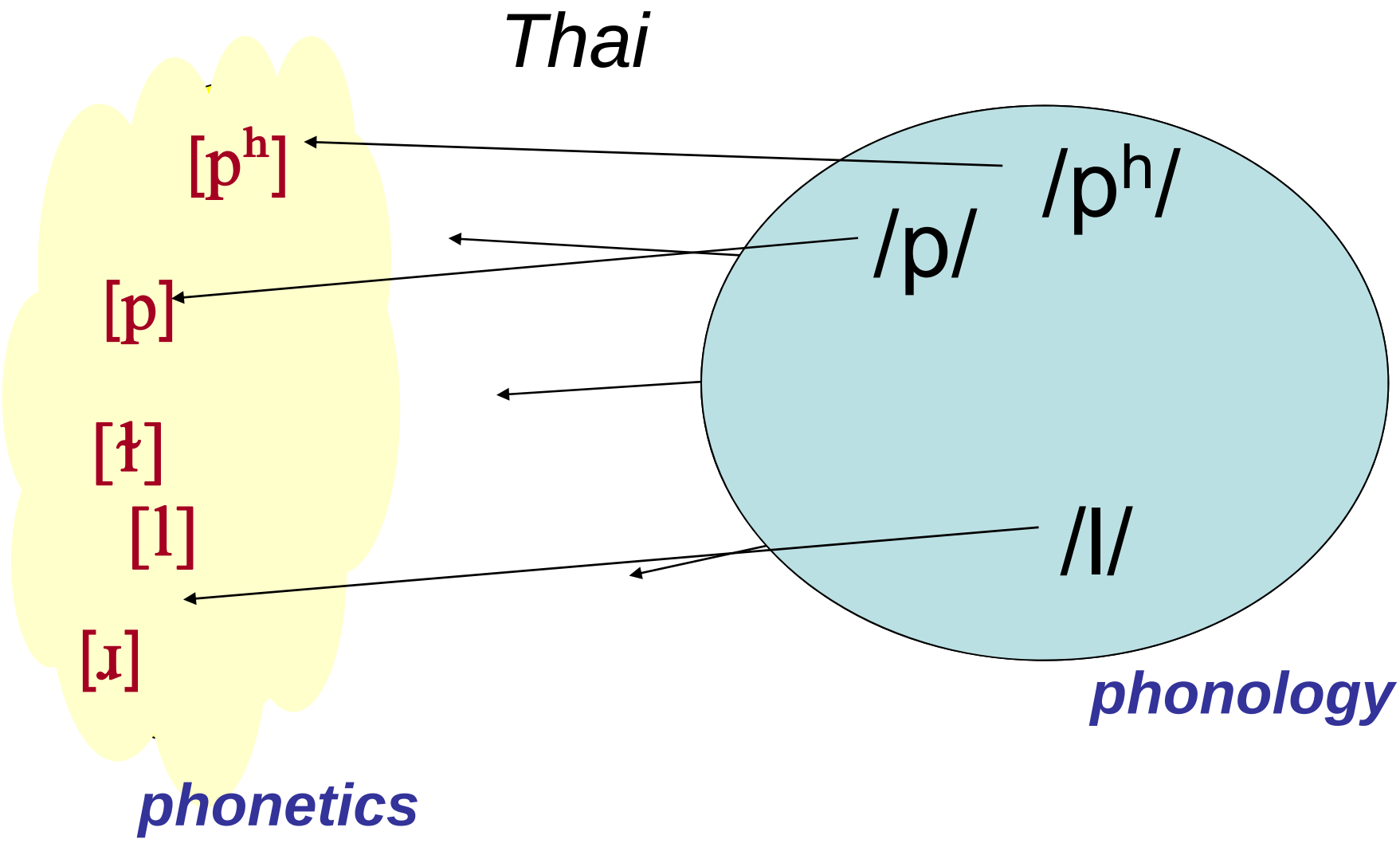
Phones, Phonemes, **Language**



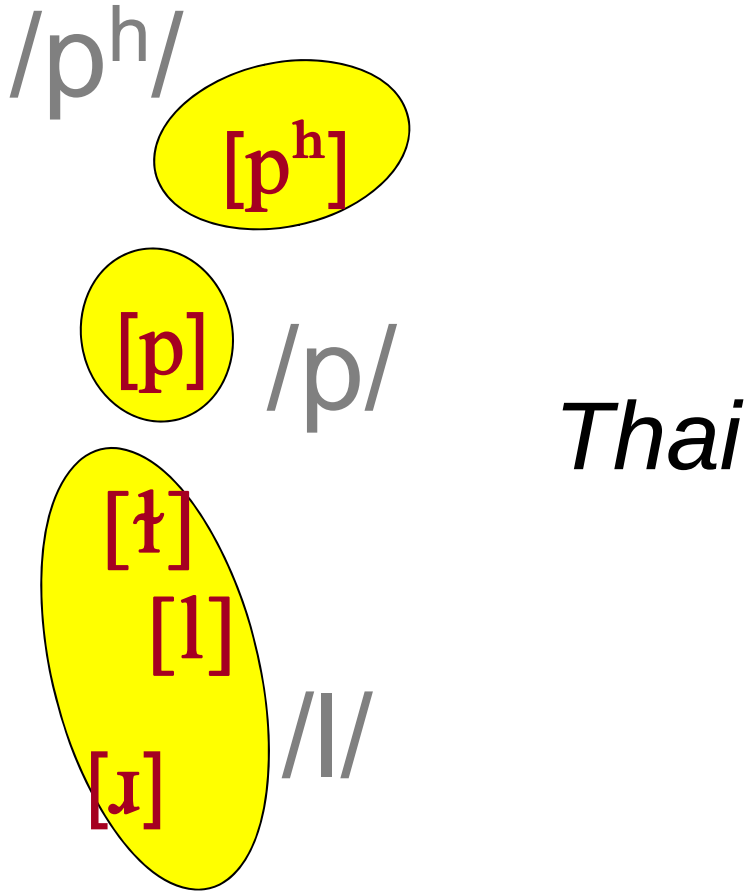
Phones, Phonemes, **Language**



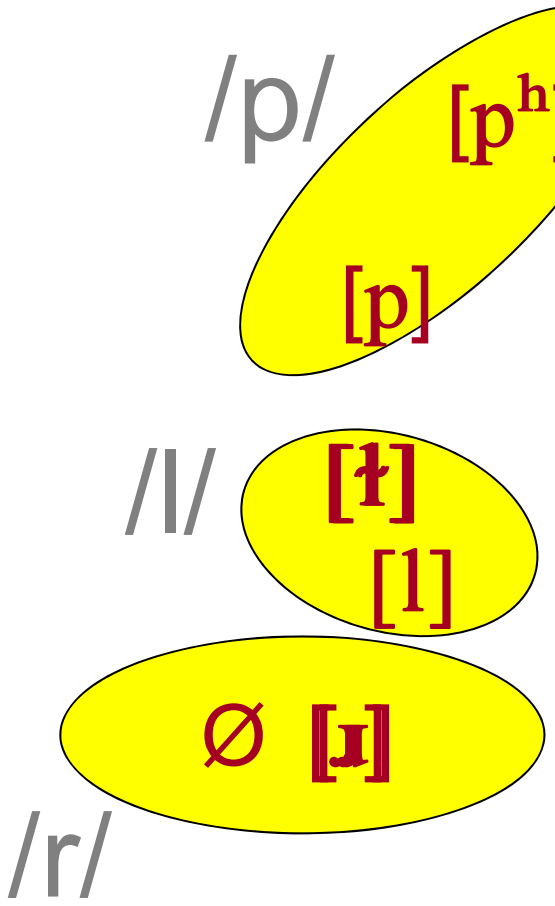
Phones, Phonemes, **Language**



Phones, Phonemes, **Language**

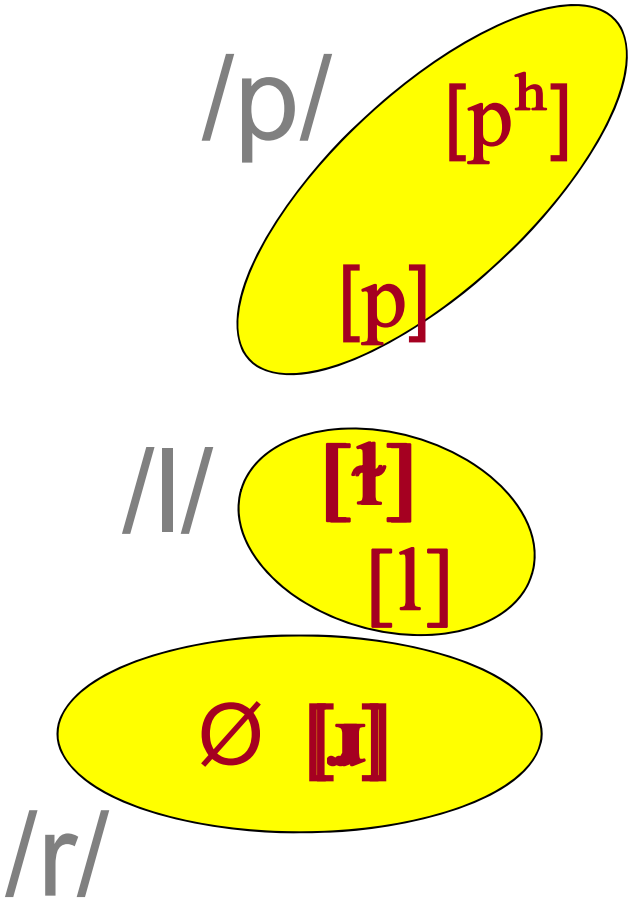


Phones, Phonemes, **Language**

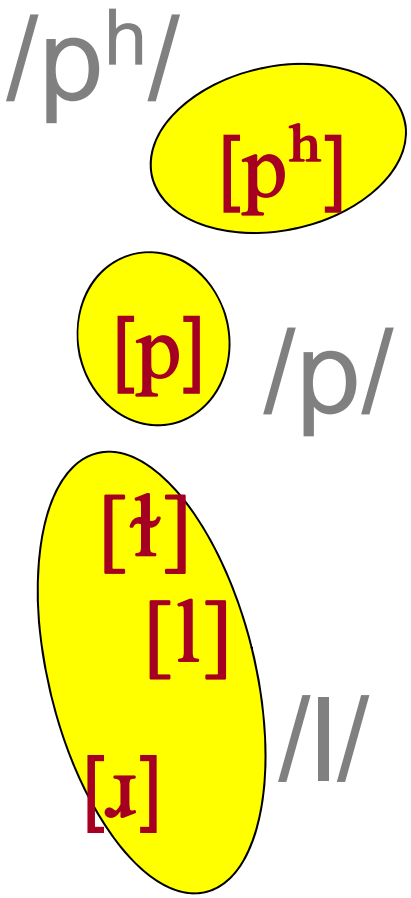


English

Phones, Phonemes, **Language**



English



Thai

Phones, Phonemes, Language

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