Phonemes

- Definition: a phoneme is a group of sounds, called allophones, which are:
  - phonetically similar, and
  - in complementary distribution or
  - in free variation

Complementary distribution

- 'Complement': that which completes
  - (Gram.) words added to verb to complete predicate
  - full number required (e.g. to make up a team)
  - of an angle: its deficiency from 90 degrees
- NB: not 'compliment', not 'complimentary distribution'

Comp. Dist. Example 1

- Aspiration in English
  - Environment 1: initially
    - e.g. pool, too, cool
  - Environment 2: after [s]
    - e.g. spool, stool, school
Comp. Dist. Example 2

- Nasal vowels in English (text’s example)
  - Env. 1: final position (bee, lay, bad)
  - Env. 2: before nasal Cs (bean, lame, bang)
  - Env. 3: before oral Cs (bead, lace, bad)
  - Envs. 1 & 3 have only oral Vs
  - Env 2 has only nasal Vs

Comp. Dist. Example 3

- Vowel length in English
  - Env 1: before vl. segments (tap, cat, duck, bus)
  - Env 2: elsewhere (tab, cad, buzz, bee, boo)

Free variation

- economics [ɪkɒnɒmɪks], ɛkɒnɒmɪks
- either [ɪðər], [ajdər]
- released vs. unreleased stops in English
  - [stap], [stæp¬]

Phonemes again

- transcription
  - phonetic [ ]
  - phonemic / /
- /p, t, k/
  - [p, t, k] / # ___ [pʰul, tʰul, kʰul]
  - [p, t, k] / #s ___ [spul, stul, skul]

Phonemes II cont’d

- /i, e, æ/
  - [ɪ, ɛ, æ] / ___ [n, m, ə] ([bɪn, lɛm, bæŋ])
  - [ɪ, ɛ, æ] / ___ # ([bɪ, le, bæ])
  - [ɪ, ɛ, æ] / ___ C ([bɪd, les, bæd])

Phonemes II cont’d

- /æ, ʌ /
  - [æ, ʌ] / ___ vl. C ([tæp, kæt, dʌk, bəs])
  - [æː, ʌː] / ___ vd. C ([tæːb, kæːd, bʌːg, bʌːz])
  - [æː, ʌː] / ___ # ([biː, buː])
A Short Cut

- minimal pair: differ in one segment only
  - pat, putt [pæt, pʌt]
  - contrastive, not complementary distribution
  - /æ, ð/ 

A Short Cut cont’d

- minimal set: differ in one segment only
  - beat [bit] boot [but]
  - bit [bɪt] butt [bʌt]
  - bait [bet] boat [bot]
  - bet [bet] (bought [bot] USA)
  - bat [bæt] bot, bought [bɔt]

A Short Cut cont’d

- minimal pairs by position
  - initial ( # ____ )
    - ‘thigh’ [θaj] contrasts with ‘thy’ [ðaj]
  - medial (V ____ V)
    - ‘ether’ [iðər] contrasts with ‘either’ [iðər]
  - final ( ____ #)
    - ‘teeth’ [tiθ] contrasts with ‘teethe’ [tið]

Phonetic similarity

- [ŋ] and [h] are in complementary distrib:
  - [ŋ] does not occur initially *[ŋæb]
  - [h] does not occur finally *[kløh]
  - [ŋ] is voiced velar nasal stop
  - [h] is a voiceless glottal approximant
  - [ŋ] & [h] not allophones of one phoneme

Distinctive Features

- distinguish one phoneme from another
  - feel / veal; seal / zeal
  - [-voiced] / [+voiced]

- rack [ræk] rock [rɑk]
  - both vowels are [+low, –round], but
  - [æ] is [–back] and [ɑ] is [+back]

Redundant Features

- predictable, non-distinctive, non-phonemic
  - spot [spɑt] / pot [pʰɑt]
  - [-aspirated] / [+aspirated]
Natural classes
- Natural class: sounds sharing features
  - nasals [+nasal]
- Can be defined by fewer features than any of its members
  - [–continuant]: [p, t, k, b, d, g, m, n, ŋ, č, š]

Major class features
- [consonantal]
  - [+cns]: consonants
  - [–cns]: vowels
- [sonorant]
  - [+son]: nasals, liquids, glides, vowels
  - [–son]: stops & fricatives (= obstruents)
- [syllabic]
  - [+syl]: Vs, syllabic liquids & nasals
  - [–syl]: Cs, glides, non-syllabic approxs

Phonological rules
- / “in the environment of”
- ___ place of segment undergoing change
- ( ) optional
- $ syllable boundary
- V > [+nasal] / ___ [+nasal](C)$
- “a V is nasalized in the environment before a nasal segment in the same syllable”

Phonological rules cont’d
- English aspiration
  - [–cnt, –voi] > [+asp] / $ ___ [V, +stress]
  - “voiceless stops are aspirated syllable initially before stressed vowels”

Morphonemic rules
- specify pronunciation of morphemes
- text discusses English plurals
- we will discuss English past tense {–D}
  - /t/: passed, ticked, bussed
  - /d/: dived, sagged, buzzed
  - /ad/: knitted, nodded
  - /t/, /d/ and /ad/ are called allomorphs

{–D} cont’d
- R1: insert a schwa before the past tense morpheme when a regular verb ends in an alveolar stop
  - R1: ø > ø / [t, d] ___ [t, d]
- R2: change the voiced /d/ to [t] when it is preceded by a voiceless sound
  - R2: t > d / [–voiced] ___
{D} cont’d

- passed buzzed nodded
- UR: /pæs+d/ /bəz+d/ /næd+d/
- R1: n/a n/a /næd+ad/
- R2: /pæs+t/ n/a n/a
- SR: [pæst] [bəzd] [nædəd]
- Phonemic representation (UR), phonetic representation (SR)

Phonological analysis

- [k] vs. [c] (vl.palatal stop) in Greek
  - [cino] ‘move’  [kufeta] ‘bonbons’
  - [ceri] ‘candle’  [kori] ‘daughter’
  - [kano] ‘do’  [krima] ‘shame’
- complementary or contrastive distribution?
  - /k/ : [c] / ___ [i, e]
- [k] elsewhere (i.e. ___ [u,o,a,r]

Phonological analysis

- [x] vs. [ç] (vl.palatal fricative) in Greek
  - [çino] ‘I pour’  [xufta] ‘dances’
  - [çeri] ‘hand’  [xori] ‘s/he dances’
  - [xano] ‘I lose’  [xrima] ‘money’
- complementary or contrastive distribution?
  - /x/ : [ç] / ___ [i, e]
- [x] elsewhere (i.e. ___ [u,o,a,r]

Additional non-phonemic contrasts in English

- [k] vs. [q]
  - keel, kill, kale, Kelly, Callie
  - cool, cook, Coke, cock(-a-doodle-do)
- [l] vs. [r]
  - Lee, lick, lake, let, lack, luck, loot, look
  - feel, fill, fail, fell, Al, fool, full, foal, fall
- Do phonological analyses of these contrasts yourselves!