Linguistics 210

Introduction to
Linguistic Analysis

Professor John Lawler

Part 1

Produced at:

EXCEL
Test Preparation
Coursepacks & Copies

1117 South University
Ann Arbor, MI 48104

(734) 996-1500

Affordable, Quality Coursepacks for the University of Michigan

Some Mistakes to Avoid in Written English

The following diction errors are very common in student papers. This page contains the bottom-line stuff. If you made these errors, don't repeat them. The first four are especially similar phenomena — all of them have to do with confusions between possessive pronouns and homophonous contractions of the same pronoun and a form of *be*.

- ***there, their,*** and ***they're***:

there is an distal deictic adverb meaning 'not here', which is also used in the English existential construction, as in *There is a unicorn in the garden.* ***their*** is a third-person plural possessive pronoun meaning 'of them'. ***they're*** is a contraction (whence the apostrophe) of the phrase *they are*. Whenever you use one of them, you should be able to say which one it is and use and spell it correctly.

- ***its*** and ***it's***:

its is a third-person neuter singular possessive pronoun meaning 'of it'. ***it's*** is a contraction (whence the apostrophe) of the phrases *it is*. and *it has*. Whenever you use one of them, you should be able to say which one it is and use and spell it correctly.

- ***your*** and ***you're***:

your is a second-person possessive pronoun meaning 'of you'. ***you're*** is a contraction (whence the apostrophe) of the phrase *you are*. Whenever you use one of them, you should be able to say which one it is and use and spell it correctly.

- ***whose*** and ***who's***:

whose is an animate possessive relative/interrogative pronoun meaning 'of whom'; it can also be used as an inanimate possessive relative pronoun, as in *the house whose windows are broken.* ***who's*** is a contraction (whence the apostrophe) of the phrases *who is* and *who has*. Whenever you use one of them, you should be able to say which one it is and use and spell it correctly.

- **The *six-year-old boy* rule:**

In English, all nominal modifiers that **precede** the noun they modify must be **single words**. If they are phrases of more than one word, they must be converted into single words by **hyphenation**. Compare a *boy six years old* with *a six-year-old boy* (note also that it's not **six-years-old boy*; modifiers must not contain plurals; it's *shoe store*, not **shoes store*, even though one buys shoes there).

- **Citation conventions:**

In linguistics, or wherever you are discussing words, it is important to distinguish carefully and consistently between **use** and **mention** of a given word. Ordinarily we just use words, and this requires no special convention. But when we are talking about a word, we need to set it off somehow so the reader will realize we're not just using it. There are several possible conventions for this; any will work provided they are **used consistently**.

For instance, you can *italicize* a word under discussion. This works especially well, of course, if you are wordprocessing. It's also the most appropriate way to deal with non-English words cited in the middle of an English sentence. In this case, you often have to give an English gloss for the non-English word; the convention for this is to put the gloss right after the italicized word in **single** quotes with **no** comma. E.g:

> In Malay, the word *hati* 'liver' is used in many of the same metaphors where *heart* would be used in English.

Alternatively, you can <u>underline</u> cited words. This is simply a typewriter convention that instructs the typesetter to use italics, so it amounts to the same thing. With the advent of the wordprocessor, the convention no longer has the utility it once did, but it is still acceptable.

> In Malay, the word <u>hati</u> 'liver' is used in many of the same metaphors where <u>heart</u> would be used in English.

Boldface is more commonly used to indicate emphasis in a text, and should not be used for marking citations. An exception is the use of boldface to draw attention to the **first** use of a technical term in a text, or the **first** citation of a particular word. In the latter case, if you are italicizing cited words, the first citation should be ***bold italic***; if you are underlining them, it should be <u>**bold underline**</u>.

Avoid the use of double quotes except for:

a) direct quotations (which must have a cited source);

or

b) "scare quotes", to indicate the same thing as the phrase *so-called*, i.e, that the author has doubts about the legitimacy of the term, takes no responsibility for it, and warns the reader of this by marking it with quotes.

   Don't overuse scare quotes; they wear **very** rapidly. Find a better term instead.

Notes on Punctuation

by Lewis Thomas*

There are no precise rules about punctuation (Fowler lays out some general advice (as best he can under the complex circumstances of English prose (he points out, for example, that we possess only four stops (the comma, the semicolon, the colon and the period (the question mark and exclamation point are not, strictly speaking, stops; they are indicators of tone (oddly enough, the Greeks employed the semicolon for their question mark (it produces a strange sensation to read a Greek sentence which is a straightforward question: Why weepest thou; (instead of Why weepest thou? (and, of course, there are parentheses (which are surely a kind of punctuation making this whole matter much more complicated by having to count up the left-handed parentheses in order to be sure of closing with the right number (but if the parentheses were left out, with nothing to work with but the stops we would have considerably more flexibility in the deploying of layers of meaning than if we tried to separate all the clauses by physical barriers (and in the latter case, while we might have more precision and exactitude for our meaning, we would lose the essential flavor of language, which is its wonderful ambiguity))))))))))).

The commas are the most useful and usable of all the stops. It is highly important to put them in place as you go along. If you try to come back after doing a paragraph and stick them in the various spots that tempt you you will discover that they tend to swarm like minnows in all sorts of crevices whose existence you hadn't realized and before you know it the whole long sentence becomes immobilized and lashed up squirming in commas. Better to use them sparingly, and with affection, precisely when the need for each one arises, nicely, by itself.

I have grown fond of semicolons in recent years. The semicolon tells you that there is still some question about the preceding full sentence; something needs to be added; it reminds you sometimes of the Greek usage. It is almost always a greater pleasure to come across a semicolon than a period. The period tells you that that is that; if you didn't get all the meaning you wanted or expected, anyway you got all the writer intended to parcel out

---

* From *The Medusa and the Snail: More Notes of a Biology Watcher* (1979:103-6).

and now you have to move along. But with a semicolon there you get a pleasant little feeling of expectancy; there is more to come; to read on; it will get clearer.

Colons are a lot less attractive for several reasons: firstly, they give you the feeling of being rather ordered around, or at least having your nose pointed in a direction you might not be inclined to take if left to yourself, and, secondly, you suspect you're in for one of those sentences that will be labeling the points to be made: firstly, secondly and so forth, with the implication that you haven't sense enough to keep track of a sequence of notions without having them numbered. Also, many writers use this system loosely and incompletely, starting out with number one and number two as though counting off on their fingers but then going on and on without the succession of labels you've been led to expect, leaving you floundering about searching for the ninethly or seventeenthly that ought to be there but isn't.

Exclamation points are the most irritating of all. Look! they say, look at what I just said! How amazing is my thought! It is like being forced to watch someone else's small child jumping up and down crazily in the center of the living room shouting to attract attention. If a sentence really has something of importance to say, something quite remarkable, it doesn't need a mark to point it out. And if it is really, after all, a banal sentence needing more zing, the exclamation point simply emphasizes its banality!

Quotation marks should be used honestly and sparingly, when there is a genuine quotation at hand, and it is necessary to be very rigorous about the words enclosed by the marks. If something is to be quoted, the *exact* words must be used. If part of it must be left out because of space limitations, it is good manners to insert three dots to indicate the omission, but it is unethical to do this if it means connecting two thoughts which the original author did not intend to have tied together. Above all, quotation marks should not be used for ideas that you'd like to disown, things in the air so to speak. Nor should they be put in place around clichés; if you want to use a cliché you must take full responsibility for it yourself and not try to fob it off on anon., or on society. The most objectionable misuse of quotation marks, but one which illustrates the danger of misuse in ordinary prose, is seen in advertising, especially in advertisements for small restaurants, for example "just around the corner," or "a good place to eat." No sin-

gle, identifiable, citable person ever really said, for the record, "just around the corner," much less "a good place to eat," least likely of all for restaurants of the type that use this type of prose.

The dash is a handy device, informal and essentially playful, telling you that you're about to take off on a different tack but still in some way connected with the present course — only you have to remember that the dash is there, and either put a second dash at the end of the notion to let the reader know that he's back on course, or else end the sentence, as here, with a period.

The greatest danger in punctuation is for poetry. Here it is necessary to be as economical and parsimonious with commas and periods as with the words themselves, and any marks that seem to carry their own subtle meanings, like dashes and little rows of periods, even semicolons and question marks, should be left out altogether rather than inserted to clog up the thing with ambiguity. A single exclamation point in a poem, no matter what else the poem has to say, is enough to destroy the whole work.

The things I like best in T.S. Eliot's poetry, especially in the *Four Quartets*, are the semicolons. You cannot hear them, but they are there, laying out the connections between the images and the ideas. Sometimes you get a glimpse of a semicolon coming, a few lines farther on, and it is like climbing a steep path through woods and seeing a wooden bench just at a bend in the road ahead, a place where you can expect to sit for a moment, catching your breath.

Commas can't do this sort of thing; they can only tell you how the different parts of a complicated thought are to be fitted together, but you can't sit, not even to take a breath, just because of a comma.

1. Turkish (Altaic)

1) deniz ..... 'an ocean'
2) denize ..... 'to an ocean'
3) denizin ..... 'of an ocean'
4) eve ..... 'to a house'
5) evden ..... 'from a house'
6) evtʃikden ..... 'from a little house'
7) deniztʃikde ..... 'in a little ocean'
8) elde ..... 'in a hand'
9) elim ..... 'my hand'
10) eller ..... 'hands'
11) diʃler ..... 'teeth'
12) diʃimizin ..... 'of our tooth'
13) diʃlerimizin ..... 'of our teeth'
14) eltʃike ..... 'to a little hand'
15) denizlerimizde ..... 'in our oceans'
16) evtʃikimde ..... 'in my little house'

17) kuʃtʃuklarimiz ..... 'our little birds'
18) kolumdan ..... 'from my arm'
19) kiztʃiklariniza ..... 'to your[pl] little girls'
20) gültʃüklerimin ..... 'of my little roses'

2. Rotokas (East Papuan)

1) avaravere ..... 'I'll go.'
2) avauvere ..... 'You'll go.'
3) avarovere ..... 'He'll go.'
4) pauravere ..... 'I'll sit.'
5) pauuvere ..... 'You'll sit.'
6) paurovere ..... 'He'll sit.'
7) vokaavere ..... 'I'll walk.'
8) vokarivere ..... 'You'll walk.'
9) vokarevere ..... 'He'll walk.'
10) pauavere ..... 'I'll build (it).'
11) paurivere ..... 'You'll build (it).'
12) paurevere ..... 'He'll build (it).'
13) avaraepa ..... 'I went.'
14) avauepa ..... 'You went.'
15) avaroepa ..... 'He went.'
16) pauraepa ..... 'I sat.'
17) pauuepa ..... 'You sat.'
18) pauroepa ..... 'He sat.'
19) vokaava ..... 'I walked.'
20) vokariva ..... 'You walked.'
21) vokareva ..... 'He walked.'
22) pauava ..... 'I built (it).'
23) pauriva ..... 'You built (it).'
24) paureva ..... 'He built (it).'

3. Amharic (Afro-Asiatic)

	Past Tense	Present Tense	Imperative	Infinitive
1) 'take'	wəsədə	yiwəsidal	wisəd	məwsəd
2) 'join'	gəṭ'ämə	yigəṭ'imal	giṭ'äm	məgṭ'äm
3) 'trade'	nəgədə	yinəgidal	nigəd	məngəd
4) 'repeat'	dəgəmə	yidəgimal	digəm	mədgəm
5) 'resemble'	məsələ	yiməsilal	misəl	məmsəl
6) 'get down'	wərədə	yiwəridal	wirəd	məwrəd

4. Mexican Spanish (Indo-European)

1)	mutʃatʃo 'boy'	7)	mutʃatʃa 'girl'	13)	ixo 'son'
2)	tio 'uncle'	8)	tia 'aunt'	14)	ixa 'daughter'
3)	sobrino 'nephew'	9)	sobrina 'niece'	15)	poeta 'poet'
4)	madre 'mother'	10)	padre 'father'	16)	ombre 'man'
5)	muxer 'woman'	11)	xente 'people'	17)	amante 'lover'
6)	mutʃatʃos 'boys'	12)	mutʃatʃas 'girls'	18)	ixos 'offspring'

19) buena xente 'nice people'
20) muxeres biexas 'old women'
21) mutʃatʃos tʃikos 'little boys'
22) amante guapo 'handsome lover'
23) padres r̃ikos 'rich parents'
24) amantes guapas 'pretty lovers'
25) mutʃatʃas tʃikas 'little girls'
26) poetas preferidos 'favorite poets'
27) tia preferida 'favorite aunt'
28) ombres brabos 'brave men'
29) poetas pobres 'poor poets'
30) ombres grandes 'big men'
31) ixo grande 'big son'
32) mutʃatʃa pobre 'poor girl'

Derivation and Inflection

Derivation and ***Inflection*** are two **functional** categories of change in morphology (***suffix***, ***prefix***, etc. are **formal** categories, since they refer to the *form* of the change). An affix or other chunk of morphology is usually either derivational or inflectional, though there is a certain grey area between them.

Most of the affixes we are familiar with in English are derivational; English has only **8** inflectional affixes. On the other hand, all of the commonly-studied European languages are **much** more inflected than English, and most of the affixes we study in learning German, French, Spanish, or Russian are inflections. It is the fact that English speakers aren't used to using a lot of inflections that makes these languages as hard as they are for English speakers to learn. That same fact makes it a bit difficult to explain the difference. But we'll try.

Below are 5 characteristics that distinguish inflections from derivations. Remember that these can apply to **any** formal class — suffixes, prefixes, infixes, root change, suppletion, reduplication, etc.

Derivational Morphemes ...	Inflectional Morphemes ...
1. **Can** change part of speech or meaning; e.g, *-ment* forms nouns such as *judgement* from verbs such as *judge*.	Do **not** change part of speech or meaning; e.g, *big* and *bigger* are both adjectives.
2. Typically indicate semantic relations **within** the word, e.g, the morpheme *-ful* in *painful* has no particular connection with any other morpheme in in a sentence,beyond the word *painful*. itself.	Typically indicate syntactic or semantic relations **between** different words in a sentence, e.g, the present tense morpheme *-s* in *waits* shows agreement with the subject of the verb (both are third person singular).
3. Typically occur with only **some** members of a class of morphemes, e.g, the suffix *-hood* occurs with just a few nouns such as *brother, neighbor,* and *knight*, but **not** with most others, e. g, *friend, daughter, candle*, etc.	Typically occur with **all** members of a of some large class of morphemes, e.g, the plural morpheme *-s* occurs with almost all count nouns in English.
4. Typically occur **before** inflectional **suffixes** (and **after** inflectional **prefixes**, though not in English); e.g, in *chillier*, the derivational suffix *-y* comes before the inflectional *-er*.	Typically occur at the **margins** of words, e.g, the plural morpheme *-s* always comes last in an English word, as in *babysitters* or *rationalizations*.
5. Instantiate a single category, which may be complex, but **never** occurs in a paradigm; e.g, there is no paradigm of all the ways there are of forming verbs from nouns, just scattered processes on different words.	Can instantiate categories that occur in **paradigmatic** sets; e.g, the categories of number and person produce the various forms of the verb: *I am, you are, he is, we are, you are, they are.*

Some Inflectional Categories

1. **NUMBER** (a category of Nouns; often agrees on other kinds of word)

   a. English: robot, robot**s**

   b. Samoan: ʔoe 'you (one)'
   ʔoulua 'you two'
   ʔoutou 'you (more than two)'

   c. French: le livre ennuyant 'the boring book'
   le**s** livre**s** ennuyant**s** 'the boring books'

2. **GENDER** (a category of Nouns; often agrees on other kinds of word)

   a. Spanish: lo**s** muchacho**s** mexicano**s**
   la**s** muchacha**s** mexicana**s**

   b. Bariba: dum bak**a** 'a big horse' yam bak**a m** 'a big space'
   kpèè bak**aru** 'a big stone' tam bak**asu** 'a big yam'
   boo bak**o** 'a big goat' gàà bak**anu** 'a big thing'
   dònòn bak**o** 'a big fire'

   c. Swahili: **wa**tu **wa**mefika 'The men have arrived'
   visu **vi**meanguka 'The knives fell'
   miti **i**mekauka 'The tree withered'

3. **CASE** (a category of Nouns; often agrees on Adjectives)

   a. English: student, student'**s**; we, us, our, ours;

   b. Finnish: 'house'

talo	nominative (subject)	talo**lle**	allative ('to')
talo**n**	accusative (object)	talo**na**	essive ('as')
talo**n**	genitive ('of')	talo**a**	partitive ('(part) of')
talo**ssa**	inessive ('in')	talo**ksi**	translative ('(changes) into')
talo**sta**	elative ('out of')	talo**tta**	abessive ('without')
talo**on**	illative ('into')	talo**in**	instructive ('with', 'by')
talo**lla**	adessive ('on')	talo**ine**	comitative ('together with')

   c. Persian: Hasan yek ketāb did 'Hasan saw the book'
   Hasan ketābrā did 'Hasan saw the book'
   Hasan ketāb did 'Hasan saw a book/books'

   d. Warlpiri: ŋatʸu kaṇa puḷami 'I shout'
   ŋatʸu**lulu** kaṇaŋku nʸuntu nʸanʸi 'I see you'
   nʸuntu**lulu** kanpatʸu ŋatʸu nʸanʸi 'you see me'

   e. German: de**r** gut**e** Mann 'the good man'
   de**s** gut**en** Manne**s** 'of the good man'

Some Inflectional Categories

4. **PERSON** (a category of Nouns* often marked on Verbs in agreement)

   a. English: speak, speaks

   b. Old Engl: folgie (1pers), folgast (2pers), falgaþ (3pers) 'follow (sg)'

   c. Samoan: ima:ua 'we two (excl)' ima:tou 'we (excl)'
   ita:ua 'we two(incl)' ita:tou 'we (incl)'

   d. Cree: okimaw iskwewa kitotew'
   'the chief (prox) talks to the women (obv)'
   okimawa iskwew kitotik
   'the chief (obv) talks to the women (prox)'

5. **TENSE** (a category of Verbs, marking time)

   a. English: walk, walked

   b. French: il parle 'he speaks'
   il parlera 'he will speak'

6. **ASPECT** (a category of Verbs, related to Tense, marking point of view)

   a. Russian: ja pročital roman 'I read (and finished) the book'
   ja čital roman 'I read (unclear if finished) the book'

   b. Irish: d'ól sé é 'he drank it'
   d'óladh sé 'he used to drink'

7. **MOOD** (a category of Verbs, marking speech act type and possibility)

   a. French: tu parles 'you speak'
   Parle! 'Speak!'

   b. Luiseño: nóo ŋéeq 'I am leaving'
   noo ŋéevíčuq 'I want to leave'

   c. Turkish: kırağaksan 'if you are going to break'
   kır + ağak + sa + n

8. **VOICE** (a category of Verbs, marking agent-patient relations)

   a, Latin: puella amat 'the girl loves'
   puella amatur 'the girl is loved'

   b. Amharic: ləkk'əmə 'he picked'
   təlәjj'əmə 'he was picked'
   ələkk'əmə 'he himself made someone pick'
   asləkk'əmə 'he caused others to make someone pick'
   ələkk'əmə 'he helped to pick'

---

* All nouns are 3rd person, by definition; only personal pronouns are 1st or 2nd.

The Inflectional Suffixes of English

Applies to: **Name:** **Symbol:**

(1) Nouns **Plural Number** **{-Z_1}**

Regular suffixal allomorphs (phonologically conditioned; preceded by epenthetic central vowel after sibilants):

/-s/ after voiceless sounds /-z/ after voiced sounds (including vowels)

Irregular suffixal allomorphs (lexically conditioned):

-Ø [i.e, Zero] in *sheep, moose, fish*, etc. /-ə/ in *data, phenomena opera*,, etc. (Latin and Greek neuter nouns); /-ay/ in *alumni, syllabi*, etc. (Latin masculine nouns); /-e/ in *alumnae* (Latin feminine nouns); /-ən/ in *oxen* (Old English)

Irregular root modifications (lexically conditioned):

Final voiceless fricatives are voiced (/f/ -> /v/, /θ/ -> /ð/, /s/ -> /z/) before adding regular suffixes in a class of nouns including *hoof, leaf, life, path*, and *house*.

Stem vowel change in: *mice, lice* (/aw/ -> /ay/), plus Zero suffix
men (/æ/ -> /ɛ/), plus Zero suffix
women (/ʊ/ -> /ʊ/), plus Zero suffix
children (/ay/ -> /ʊ/), plus irregular suffix /-rən/

(2) Nouns **Possessive Enclitic** **{-Z_2}**

Regular suffixal allomorphs — identical to (1) above.

Note: this inflection is changing from suffix to enclitic status; it now attaches to the last word in a Noun Phrase (NP), instead of a Noun, e.g, *The Prince of Denmark's soliloquy*, not-**The Prince's of Denmark soliloquy*.

(3) Verbs Present Tense, 3rd Person, Singular Number {-Z_3}

Regular suffixal allomorphs — identical to (1) above.

Irregular suffixal allomorph (lexically conditioned):

-Ø in *she can, she will, she may*, etc. (modal auxiliaries)

Irregular root modification:{*have* + Z_3} = /hæz/ (/v/ -> Ø before /-z/)

Irregular root suppletion:{*be* + Z_3} = /ɪz/[1]

(4) Verbs **Past Tense** **{-ED}**

Regular suffixal allomorphs, phonologically conditioned:

/-t/ after voiceless sounds, /-d/ after voiced sounds (including vowels)

(preceded by epenthetic /ə/ or /ɨ/ after dental stops /d/ and /t/)

Irregular suffixal allomorphs (lexically conditioned):

-Ø in some 1-syllable /d/- or /ʊ/-final verbs: *beat, bet, burst, cast, cost, cut, hit, hurt, knit, let, put, rid, set, shed, shut, slit, shit, spit, split, spread*, and *thrust*

/d/ -> /ʊ/ in some 1-syllable /d/-final verbs: *bent, built, lent, sent*, and *spent*.

/-ʊ/ after some vowel-changed roots (others take -Ø; see below)

---

1. All forms but one of {*be*} are irregular: /ɛm/, /ɪz/, /ar/, /wəz/, /wər/, /bɪn/; cf. /biyɪŋ/

The Inflectional Suffixes of English

(4) Verbs Past Tense {-ED} (Continued)

Irregular root modifications (lexically conditioned):

Pure vowel changes: *hid, ate, lay, came, read, ran, sang, swung, struck, got, shot, wound, swore, saw, fought, wrote, chose, stole, shook, grew, drew,* etc.

Other root modifications: *slept, dealt, bought, sold, said, lost, sought, left, made,* etc.

Irregular root suppletion (lexically conditioned): {*go* + ED} = /wɛnt/

(5) Verbs Past Participle {-EN$_1$}

Regular suffixal allomorphs — identical to (4) above. Many irregulars are also identical to the past tense form: *fought, dug, read, won, struck, got, shot,* etc. Others are identical to the present, even if the past is irregular: *come, run,* etc.

Irregular suffixal allomorph (lexically conditioned):

/-ən/ in some "strong" verbs: *shaken, beaten, spoken, broken, bitten,* etc.

/-n/ in others, especially after vowels: *known, torn, done, drawn, seen,* etc.

Irregular root modifications (lexically conditioned):

Pure vowel changes (all /ə/): *sung, swung, drunk, swum, sprung,* etc.

6) Verbs Present Participle (Gerund) {-ING}

Regular suffixal allomorph — /-ɪŋ/

Note: This morpheme has <u>no</u> irregularities. (This is meta-irregular.)

(7) Verbs Infinitive {-ϕ}

Regular suffixal allomorph —Zero

Note: This morpheme has a distinct form only in the verb *be.*

(8) Adjectives Comparative {-ER$_1$}

Regular suffixal allomorph — /-ər/

Note: This morpheme applies only to monosyllabic adjectives and adverbs, bisyllabic ones that end in /-i/ (e.g, *heavier, happier*), and <u>some</u> bisyllabic ones that end in /-o/ (e.g, *shallower, narrower,* but not **mellower*).

Irregular suppletive forms: {*good/well* + -ER$_1$} = *better*

{*bad* + -ER$_1$} = *worse*

{*much* + -ER$_1$} = *more*

(9) Adjectives Superlative {-EST}

Regular suffixal allomorph — /-əst/

Note: This morpheme has the same lexical and phonological restrictions as (7) above; if a given adjective or adverb takes (7), it will take (8), and if it has an irregular allomorph of (7), it has an irregular allomorph of (8).

Irregular suppletive forms: {*good/well* + -EST} = *best*

{*bad* + -EST} = *worst*

{*much* + -EST} = *most*

Hungarian (Uralic)

Gloss	Singular	Plural
1. 'table'	astal	astalok
2. 'worker'	munka:š	munka:šok
3. 'man'	ember	emberek
4. 'white'	fehe:r	fehe:rek
5. 'this'	ez	ezek
6. 'line'	šor	šorok
7. 'eyeglasses'	semüveg	semüvegek
8. 'shirt'	iŋ	iŋek
9. 'head'	fey	feyek
10. 'box'	doboz	dobozok
11. 'drum'	dob	dobok
12. 'age'	kor	korok
13. 'coat'	kaba:t	kaba:tok
14. 'flower'	vira:g	vira:gok

Michoacan Nahuatl (Uto-Aztecan)

[nokali]	'my house'	[mopelo]	'your dog'
[nokalimes]	'my houses'	[mopelomes]	'your dogs'
[mokali]	'your house'	[ipelo]	'his dog'
[ikali]	'his house'	[nokwahmili]	'my cornfield'
[kali]	'house'	[mokwahmili]	'your cornfield'
[kalimes]	'houses'	[ikwahmili]	'his cornfield'
[nopelo]	'my dog'	[ikwahmilimes]	'his cornfields'

What does *ipelo* mean in this language?

How would you say 'his cornfields' in Michoacan?

Isthmus Zapotec

1. [ñee]	'foot'	11. [kazigitu]	'your (pl.) chins'
2. [kañee]	'feet'	12. [kazigidu]	'our chins'
3. [ñeebe]	'his foot'	13. [zike]	'shoulder'
4. [kañeebe]	'his feet'	14. [zikebe]	'his shoulder'
5. [ñeelu?]	'your foot'	15. [kazikelu?]	'your shoulders'
6. [kañeetu]	'your (pl.) feet'	16. [diaga]	'ear'
7. [kañeedu]	'our feet'	17. [kadiagatu]	'your (pl.) ears'
8. [kazigi]	'chins'	18. [kadiagadu]	'our ears'
9. [zigibe]	'his chin'	19. [bisozedu]	'our father'
10. [zigilu?]	'your chin'	20. [bisozetu]	'your (pl.) father'
		21. [kabisozetu]	'your (pl.) fathers'

Quiché (Mayan)

1. kiŋsikíx le líbr.....'I read (present tense) the book.'
2. kusikíx le líbr.....'He reads the book.'
3. kiŋwetamáx le kém.....'I learn the (art of) weaving.'
4. kataxín kiŋwetamáx le kém .....'I continually learn the (art of) weaving.'
5. kataxín kawetamáx le kém .....'You continually learn the (art of) weaving.'
6. šiŋwetamáx.....'I learned (it).'
7. šuwetamáx le kém.....'He learned the (art of) weaving.'
8. šasikíx le líbr iwír.....'You read the book yesterday.'

Sample Quiz

Linguistics 210 Name_____ Sec ___

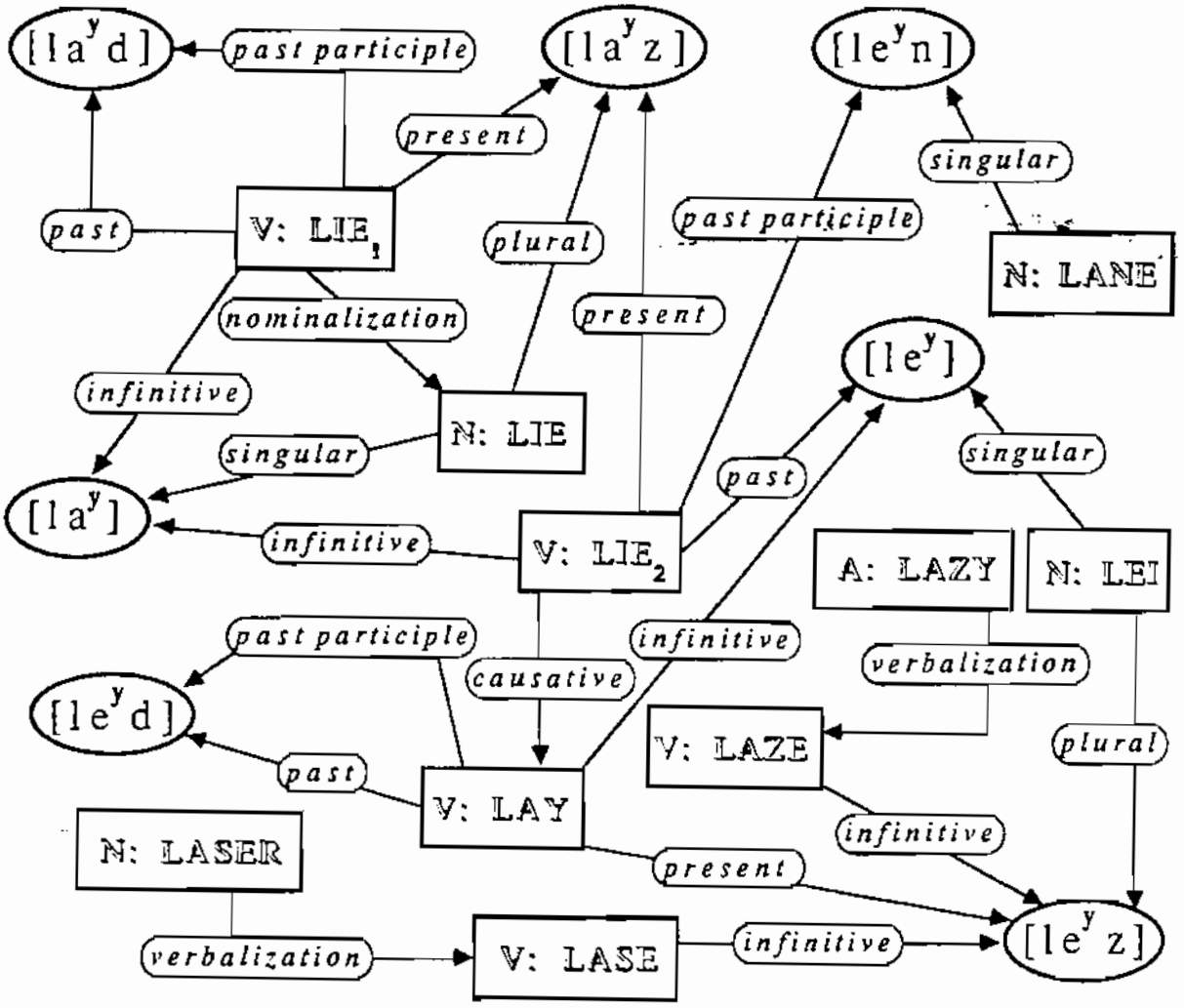
SAMOAN (Austronesian)

1.	manao	(he) wishes	mananao	(they) wish
2.	matua	(he) is old	matutua	(they) are old
3.	malosi	(he) is strong	malolosi	(they) are strong
4.	punou	(he) bends	punonou	(they) bend
5.	savali	(he) travels	savavali	(they) travel
6.	pese	(he) sings	pepese	(they) sing
7.	laga	(he) weaves	lalaga	(they) weave
8.	atama?i	(he) is wise	atamama?i	(they) are wise

What type of affix is used to make the form of the verb used with a plural subject? Describe its form and relationship to the stem.

Given /galue/ '(he) works', what would be the most likely form with a plural subject?

Given /alolofa/ '(they) love', what would be the most likely form with a singular subject.



V: LIE	V: LAY — past → [le^y d]	[le^y z]
1. Lexeme	2. Word-Form	3. Phonological Word

Three kinds of "Word" as exemplified in a small portion of the morphological network of the English verbs *lie*$_1$ 'tell an untruth' (with its associated nominalization *lie* 'an untruth') and *lie*$_2$ 'recline' (with its associated causative verb *lay* 'cause to recline'). Some relationships with other lexemes are also shown.

Bayramlaşamadıklarımızdandır.

/bayramlaʃamadiklarɨmɨzdandɨr/

'He is among those with whom we haven't
been able to exchange season's geetings.'

bayram *'holiday'*

bayramlaş *'exchange season's greetings'*
-la = denominal;
-ş = reciprocal form.

-ama *'not being able to do'* form of verb.

-dık deverbal noun (cf. Eng *-er, -ist*)

-lar plural

-ımız 1st person plural possessive ending

-dan Ablative case ending, *'from'*

-dır enclitic denoting 3rd pers. of verb *'to be'*
(< 3rd pers. aorist of verb *durur* 'to stand, stop').

IL TORNEO DEI TRASPORTATORI STAMPA

Il *Paese Sera* supera il *Corriere dello Sport* 7-0

Nel torneo di calcio dei Trasportatori Stampa organizzato dal Sindicato in collaborazione con l'U.I.S.P. di Roma, la squadra dei trasportatori del *Paese Sera* ha battuto la squadra del *Corriere dello Sport* per ben 7-0. Praticamente la nostra squadra si puo gia cosiderare semifinalista.

Le squadra sono scese in campo nelle seguente formazioni:

Paese Sera: Speca; Iattanzi; Montilla; Pironti; Magagnini; Romozzi; Iannelli; Porcu; Seghetti I; Seghetti II; Teti.

Corriere dello Sport: Santilli; Ciucci; Elmi; Pighi; Di Maggio I; Carciolli; Collalunga; Di Maggio II; Di Maggio III; Del Pelo; Giovannola.

Le reti sono realizzati da Porcu al 17' ed al 30' del primo tempo; da Seghetti I al 15', 19', 23', ed al 31', autogol del *Corriere dello Sport* al 34'. Ottimo l'arbitraggio del Sig. Tranquilli di Roma.

Clues

1) *IL TORNEO DEI TRASPORTATORI STAMPA* = *THE TOURNAMENT OF NEWSPAPER BOYS*

2) *Paese Sera* and *Corriere dello Sport* are the names of two Italian newspapers and need not be translated. This article was published in *Paese Sera* .

3) calcio = soccer

Underlying Forms (in several languages)

English

1.	ɔ́rəm	'autumn'	5.	ɔtə́mnəl	'autumnal'
2.	hím	'hymn'	6.	hímnəl	'hymnal'
3.	nɔrm	'norm'	7.	nɔ́rməl	'normal'
4.	sízən	'season'	8.	sízənəl	'seasonal'

What are the underlying forms of the nouns in 1-4?

German

1.	tsita:t	'selection'	5.	tsita:tə	'selections'
2.	bo:t	'boat'	6.	bo:tə	'boats'
3.	gra:t	'degree'	7.	gra:də	'degrees'
4.	li:t	'song'	8.	li:də	'songs'

The plural ending for these nouns is /-ə/. That part is simple; more interesting is: What are the underlying forms of the noun roots?

Latin

	Nom.	Gloss	Gen.	Dat.	Acc.
1.	pleps	'commoner'	plebis	plebi:	plebem
2.	lapis	'stone'	lapidis	lapidi:	lapidem
3.	honos	'honor'	honoris	honori:	honorem
4.	noks	'night'	noktis	nokti:	noktem
5.	re:ks	'king'	re:gis	re:gi:	re:gem
6.	lu:ks	'light'	lu:kis	lu:ki:	lu:kem
7.	fruks	'fruit'	frugis	frugi:	frugem
8.	yu:s	'law'	yu:ris	yu:ri:	yu:rem
9.	mi:les	'soldier'	mi:litis	mi:liti:	mi:litem
10.	homo:	'human being'	hominis	homini:	hominem

The case endings for these nouns ("Nominative" = subject of sentence; "Genitive" = possessive; "Dative" = indirect object"; "Accusative" = direct object) are mostly regular. The roots aren't.

What should be the underlying root form in each case?

On what basis does one make this decision? Why?

Cree (Algonquian)

1.	či:ma:n	canoe	12.	nitospwa:kan	my pipe
2.	niči:ma:n	my canoe	13.	akimew	he counts
3.	so:niya	money	14.	nitakimen	I count
4.	niso:niya	my money	15.	apiw	he sits
5.	wiya:š	meat	16.	nitapin	I sit
6.	niwiya:š	my meat	17.	ispelohkew	he rests
7.	e:mihkwa:n	spoon	18.	nitispelohken	I rest
8.	nite:mihkwa:n	my spoon	19.	kaakimew	he will count
9.	astotin	hat	20.	nikaakimen	I will count
10.	nitastotin	my hat	21.	kaapiw	he will sit
11.	ospwa:kan	pipe	22.	nikaapin	I will sit

Hanunoo (Austronesian)

1.	ʔusa	'one'	8.	kasʔa	'once'	15.	ʔusahi	'make it one'
2.	duwa	'two'	9.	kadwa	'twice'	16.	duwahi	'make it two'
3.	tulu	'three'	10.	katlu	'three times'	17.	tuluhi	'make it three'
4.	ʔupat	'four'	11.	kapʔat	'four times'	18.	ʔupati	'make it four'
5.	lima	'five'	12.	kalima	'five times'	19.	limahi	'make it five'
6.	ʔunum	'six'	13.	kanʔum	'six times'	20.	ʔunumi	'make it six'
7.	pitu	'seven'	14.	kapitu	'seven times'	21.	pituhi	'make it seven'

English (Indo-European)

1. Actual English nouns

Spelling	Pronunciation	Plural pronunciation
slab	/slæb/	/_____/
hash	/hæš/	/_____/
tuna	/t ú n ə/	/_____/
book	/b u k/	/_____/
giraffe	/ǰ ə r æ f/	/_____/
garage	/g ə r á ž/	/_____/
tree	/t r i/	/_____/
dog	/d ɔ g/	/_____/
mesh	/m ɛ š/	/_____/
latch	/l æ č/	/_____/
trace	/t r e s/	/_____/
judge	/ǰ ə ǰ/	/_____/
store	/s t ɔ r/	/_____/
slough	/s l u/	/_____/

2. Hypothetical English nouns (assume any meanings you like)

'Spelling'	Pronunciation	Plural pronunciation
sab	/s æ b/	/_____/
fauche	/f o š/	/_____/
eima	/é m ə/	/_____/
shuque	/š u k/	/_____/
hafe	/h e f/	/_____/
mauge	/m o ž/	/_____/
feeny	/f í n i/	/_____/
saug	/s ɔ g/	/_____/
besh	/b ɛ š/	/_____/
gatch	/g æ č/	/_____/
hess	/h ɛ s/	/_____/
borge	/b ɔ r ǰ/	/_____/
sclear	/s k l ɪ r/	/_____/
boux	/b u/	/_____/

What is the rule for forming the English noun plural?

Japanese

	Verb Stems	Gerund forms
1.	tabe- ..... eat	tabete ..... eating
2.	yob- ..... call	yonde ..... calling
3.	shin- ..... die	shinde ..... dying
4.	kak- ..... write	kaite ..... writing
5.	yom- ..... read [rid]	yonde ..... reading
6.	mi- ..... see	mite ..... seeing
7.	asob- ..... play	asonde ..... playing
8.	tob- ..... fly	tonde ..... flying
9.	aruk- ..... walk	aruite ..... walking
10.	nom- ..... drink	nonde ..... drinking

11. aketa ..... opened
12. akarareta ..... was opened
13. akesaseta ..... caused to open
14. akesaserareta ..... was caused to open
15. tabeta ..... ate
16. taberareta ..... was eaten
17. tabesaseta ..... caused to eat
18. tabesaserareta ..... was caused to eat
19. yonda ..... read [rɛd]
20. yomareta ..... was read
21. yomaseta ..... caused to read
22. yomaserareta ..... was caused to read
23. tonda ..... flew
24. tobareta ..... was flown
25. tobaseta ..... caused to fly
26. tobaserareta ..... was caused to fly
27. ataeta ..... awarded
28. ataerareta ..... was awarded
29. ataesaseta ..... caused to award
30. ataesaserareta ..... was caused to award
31. eranda ..... chose
32. erabareta ..... was chosen
33. erabaseta ..... caused to choose
34. erabaserareta ..... was caused to choose

Lamba (West Africa)

Lamba has several inflections for verbs (only some of which occur in English — don't worry about what the terms *Applied*, *Neuter* and *Reciprocal* mean).

Past	Passive	Neuter	Applied	Reciprocal	Gloss
čita	čitwa	čitika	čitila	čitana	'do'
tula	tulwa	tulika	tulila	tulana	'dig'
četa	četwa	četeka	četela	četana	'spy'
soŋka	soŋkwa	soŋkeka	soŋkela	soŋkana	'pay tax'
fisa	fiswa	fišika	fišila	fisana	'hide'
kosa	koswa	koseka	kosela	kosana	'be strong'

1. Give the roots for each verb. Don't forget the hyphen.

do _____

dig _____

spy _____

hide _____

pay tax _____

be strong _____

2. State the rules for making the various verb forms from the root.

Past

Passive

Neuter

Applied

Reciprocal

Latin (Indo-European)

familiaris	regularis	minimalis	principalis
animalis	mortalis	lunaris	floralis
liberalis	coronalis	hospitalis	militaris
capitalis	consularis	navalis	lateralis
pluralis	regalis	peculiaris	popularis
singularis	virginalis	dorsalis	corporalis

All the words above are Latin adjectives, and they all mean just about exactly what you think they should mean — that is, English has borrowed them all very straightforwardly, and they are all now English words, too, though of course without the Latin Nom. Sg. adjective suffix ***-is*** (occasionally some have added other morphology, like *militar-y*).

They do share one other interesting feature: in addition to ***-is***, they all have the same suffix morpheme, which forms adjectives in Latin from other kinds of root.

(1) Is this morpheme derivational or inflectional? Why?

(2) What are the two allomorphs of the morpheme?

(3) State the rule for determining which allomorph appears.
[Note: make sure you check all the words to see that it works]

(4) Is this rule now a rule of English as well as of Latin?

Notes on Lushootseed problem

1. Skagit is a dialect of Lushootseed, which is a Salishan language spoken on the east coast of Puget Sound, in Washington state. URLs:
   The Ethnologue: http://www.ethnologue.com/
   Salishan languages: http://www.ethnologue.com/show_iso639.asp?code=sal
   Lushootseed: http://www.ethnologue.com/show_language.asp?code=LUT

2. All Salishan languages, including Lushootseed, are ***polysynthetic***. This means that they tend to have many morphemes per word, and that sentences often consist of one heavily inflected word. Polysynthetic languages make heavy use of morphology and relatively little use of syntax; they are at the other end of the typological spectrum from ***analytic*** languages, which make little (sometimes no) use of morphology, and heavy use of syntax. English is an analytic language.
   Glossary of linguistic terms: http://www.sil.org/linguistics/glossaryoflinguisticterms/index.htm

3. Lushootseed has a ***CVC root system***. This means that the roots of ***open classes*** (nouns, verbs, etc.) tend to be very simple in structure, usually consisting of a single syllable, with a consonant (or two) at the beginning, a vowel in the middle, and another consonant (or two) at the end. However, the words formed from these roots are not simple, since many other morphemes get added to the root. The first thing to do in this problem, therefore, is to identify the root in each sentence. Several of the CVC roots in this problem occur with -VC derivational suffixes, so that the unchanging part is actually two syllables long. One verb root (borrowed from Quileute, an unrelated Chimakuan language on the Olympic Peninsula) is actually three syllables long.
   What is a root?: http://www.sil.org/linguistics/glossaryoflinguisticterms/WhatIsARoot.htm
   What is an open class?:
   http://www.sil.org/linguistics/GlossaryOfLinguisticTerms/WhatIsAnOpenClass.htm
   Quileute: http://www.ethnologue.com/show_language.asp?code=QUI

4. Lushootseed does not have ***tense***, but it has a very complex ***aspect*** system. Several different aspect markers can co-occur, but – like all morphology – they must occur in the correct order. Classes of aspect morphemes that occur in a specific position in the word relative to other aspect markers are called ***positional classes***.
   What is tense?: http://www.sil.org/linguistics/GlossaryOfLinguisticTerms/WhatIsTense.htm
   What is aspect?: http://www.sil.org/linguistics/GlossaryOfLinguisticTerms/WhatIsAspect.htm

5. ***Imperative*** forms of a verb are used to issue orders, and are usually either uninflected or less inflected than other verb forms; if bare roots or stems exist anywhere in a language, they will often appear in an imperative.
   What is imperative?:
   http://www.sil.org/linguistics/GlossaryOfLinguisticTerms/WhatIsImperativeMood.htm

6. The term 'adverbs' is put in 'scare quotes' in the questions to indicate that it is not a very good name for the class of morpheme that it refers to. 'Adverb' is used to identify this class because the Lushootseed morphemes in the class translate into English adverbs, but they don't work at all like English adverbs in terms of their grammar. **Hint**: Look for the s- that occurs with them. What other roots begin with s- in this language data? What could the function of s- be?

7. Unsurprisingly, there is internal structure in the word for 'tomorrow' (*ʔuɬuk"ačiləs*), but we don't have enough data to determine what it is, so we must simply consider it a single word, for now.

Lushootseed (Skagit; Salishan)

Problem 1

1. ʔəlc̓uʔíbəšʔətəlùx̌ ..... 'The old man is walking.'
2. ʔəlc̓uʔíbəšʔəcəlùx̌ ..... 'The old woman is walking.'
3. ʔuʔíbəšʔətəlùx̌ ..... 'The old man walked.'
4. ʔuʔíbəšʔətəstùbš ..... 'The man walked.'
5. ɬuʔíbəšʔəcəsɬàdəy ..... 'The woman will walk.'
6. ʔutəláwilʔətəstùbš ..... 'The man ran.'
7. ɬutl̓ílibʔəcəsɬàdəyʔuɬukʷáčiləs... 'The woman will sing tomorrow.'
8. ʔáɬtəsʔuʔibəšʔətəstùbš ..... 'The man walked fast.'
9. háʔɬtəɬustl̓ílibʔətəlúx̌ ..... 'The old man will sing well.'
10. x̌utəláwilʔətəstùbš ..... 'The man runs [habitually].'
11. ʔáɬtəx̌ustəlàwilʔətəstúbš ..... 'The man runs fast [habitually].'
12. ʔəlc̓utl̓ílibəxʷʔətəstùbš ..... 'The man is singing now.'
13. ʔutl̓ílibʔəcəsɬàdəy ..... 'The woman sang.'
14. ʔəlc̓uyíq̓ibʔəcəlùx̌ ..... 'The old woman is making baskets.'
15. ʔuyíq̓ibʔətəstùbš ..... 'The man made baskets.'
16. x̌uyíq̓ibʔəcəsɬàdəy ..... 'The woman makes baskets [habitually].'
17. ʔáɬtəsʔəlc̓uʔìbəšʔətəstúbš ..... 'The man is walking fast.'
18. tl̓ílibɬi ..... 'Sing! [plural subject]'
19. təláwil ..... 'Run!'

---

1) List and gloss the root morphemes for all open classes.
2) List the affixes and indicate their relative placements.
   [Note: There is no significant allomorphy in this data]

Some questions you should be able to answer:

a) What is the meaning of /lùx̌/?
b) How (and when) is gender marked?
c) Translate the following into Skagit: 'The old woman makes good baskets.'
d) How are "adverbs" like 'fast' and 'well' expressed?
e) There are two positional classes of tense/aspect markers. Which morphemes are in which class, and how do you tell? [HINT: look for the *-s-* with "adverbs"]

Lushootseed (Skagit; Salishan)
Problem 2

1. sájəbtəstùbš . . . . . 'The man is tall.'
2. m̓ím̓aʔdtəstùbš . . . . . 'The man is small.'
3. m̓ím̓aʔdtəsqʷəbàyʔ . . . . . 'The dog is small.'
4. ʔəsx̌áɬcəsɬàdəy . . . . . 'The woman is sick.'
5. ʔəsʔítuttəlùx̌ . . . . . 'The old man is asleep.'
6. qáǰətəbtəstùbš . . . . . 'The man is (a) Skagit.'
7. qqáǰətəbtəstùbš . . . . . 'The man speaks Skagit.'
8. láʔbsájəbtəlùx̌ . . . . . 'The old man is very tall.'
9. háʔɬubščəsɬàdəy . . . . . 'The woman is pretty.'
10. ʔəsqáɬcəlùx̌ . . . . . 'The old woman is awake.'
11. ʔuk̓ʷáɬtəqʷù . . . . . 'The water spilled.'
12. stíbtibtestùbš . . . . . 'The man is strong.'
13. tustíbtibtestùbš . . . . . 'The man was once strong.'
14. ʔəst̓ástəqʷù . . . . . 'The water is cold.'
15. híkʷtəc̓əbìdʔac . . . . . 'The fir tree is tall.'
16. tum̓ím̓aʔdtəc̓əbìdʔac . . . . . 'The fir tree was small.'
17. híkʷtəspàʔc . . . . . 'The bear is big.'
18. tut̓ílibətəc̓àc̓əs . . . . . 'The child already sang.'
19. háʔɬtətusyìq̓ibʔəcəsɬádəy . . 'The woman used to make good baskets.'
20. ʔəsǰúʔilcəsɬàdəy . . . . . 'The woman is happy.'
21. tuʔəsʔítutcəsɬàdəy . . . . . 'The woman was asleep.'
22. tuʔəlc̓uʔíbəšʔətəstùbš . . . . . 'The man was walking.'
23. ɬuʔəsǰúʔiltəc̓àc̓əs . . . . . 'The child will be happy.'
24. bəʔəlc̓ut̓ílibʔətəstùbš . . . . . 'The man is singing again.'
25. ɬubəʔut̓ílibʔəcəsɬàdəy . . . . . 'The woman will sing again.'
26. ʔəlc̓uqáləb . . . . . 'It's raining.'
27. ʔəlc̓uqáləbakʷ . . . . . 'It's starting to rain.'
28. bəʔəlc̓uqáləbakʷ . . . . . 'It's starting to rain again.'
29. duqʷáləbixʷcəsɬàdəy . . . . . 'The woman is (a) Snoqualmie.'
30. dduqʷáləbixʷcəsɬàdəy . . . . . 'The woman speaks Snoqualmie.'

There are 2 typos in the data. Find them.

Maori (Austronesian)

Active	Passive	Gerund	Gloss	Stem
afi	afitia	afitaŋa	embrace	_____
hopu	hopukia	hopukaŋa	catch	_____
aru	arumia	arumaŋa	follow	_____
paa	paaŋia	paaŋaŋa	shut	_____
mau	mauria	mauraŋa	carry	_____
wero	werohia	werohaŋa	stab	_____

1. Fill in the stems for each verb in the space above.

2. Fill in the blanks below with the correct suffixal forms:

   Passive: _____ Gerund: _____

3 How is the Active formed from the underlying stem in Maori?

4. Here is some additional data. You may assume it uses the same suffixes as the previous data. Fill in the stems, as above.

patu	patua	patuŋa	strike	_____
kite	kitea	kiteŋa	see	_____

   Given this additional data, and using the stems you have filled in, what changes are necessary to account for the formation of Passive, Active, and Gerund?

Classical Nahuatl (Uto-Aztecan)

1. ničo:ka ..... I cry.
2. ničo:kani .....I am crying.
3. ankočinih ..... You (pl) are sleeping.
4. tikočih .....We sleep.
5. kočiya.....:He was sleeping.
6. kwi:kas ..... He will sing.
7. ankočiyah.....You (pl) were sleeping.
8. ničo:kas.....I will cry.
9. čo:kayah.....They were crying.
10. tikoči ..... You (sg) sleep.
11. ančo:kah..... You (pl) cry.
12. tikočis..... You (sg) will sleep.
13. tičo:kayah ..... We were crying.
14. čo:ka.....He cries.
15. kočini .....He is sleeping.
16. ančo:kayah ..... You (pl) were crying.
17. tičo:kanih .....We are crying.
18. kwi:kah ..... They sing.
19. tikwi:kani..... You (sg) are singing.
20. nikwi:kaya.....I was singing.
21. čo:kanih ..... They are crying.

Describe the morphology.

Translate the following Nahuatl forms into English.

1. tikwi:ka
2. čo:kani
3. nikočiy

Translate the following English sentences into Nahuatl.

1. You (sg) are sleeping.
2. They will sing.
3. We cry.

Nahuatl (Uto-Aztecan)

1. kalli	house	17. kakɬi	sandal
2. a·ɬ	water	18. a·to·lli	gruel
3. te·kʷɬi	lord	19. esɬi	blood
4. te·šɬi	brother-in-law	20. koyo·ɬ	coyote
5. ta?ɬi	father	21. točɬi	rabbit
6. teo·ɬ	god	22. okičɬi	man
7. šočiɬ	flower	23. ikšiɬ	foot
8. ilwikaɬ	sky, heaven	24. aɬaɬ	atlatl
9. kʷawɬi	eagle	25. o?ɬi	road
10. ko·lli	grandfather	26. okɬi	wine, pulque
11. to·to·ɬ	bird	27. ko·a·ɬ	snake
12. pilli	son, boy	28. ɬa·kaɬ	person
13. masa·ɬ	deer	29. siwa·ɬ	woman
14. na·nɬi	mother	30. tepe·ɬ	mountain
15. a·kalli	canoe	31. picoɬ	pig
16. kone·ɬ	child	32. ti·siɬ	doctor

Each of these nouns contains a noun stem plus an affix that we will call the **absolutive** marker (it occurs on nouns that do not have personal possessive affixes). Your first job is to determine the stems. In the process you will also determine the allomorphs of the absolutive affix.. List the allomorphs and describe their distribution.

Are these allomorphs ***lexical*** facts? I.e, do we have three lexical classes? Or are these allomorphs ***phonologically*** conditioned? If so, you will be able to state the environment in which each occurs.

If you have opted for a phonological solution, decide on an underlying form of the morpheme and formulate rules which account for the data. Choose examples and give illustrations of the different types of derivations you find in the data.

Notation:

[?] represents a **glottal stop.**
A raised dot following a vowel, e.g [a·], represents a **long vowel.**
Barred Lambda, i.e [ɬ], is a **voiceless lateral affricate,**
a complex consonant composed of
a **voiceless dental stop** [t], releasing into
a **voiceless lateral fricative** [ɬ], i.e [tˡ]

Pocomchí (Mayan)

Below is a list of inflected present tense verb forms in Pocomchí; thus, for instance, tinitow means 'I help you' and inwil means 'I see him'.

Describe and give paradigms.for the system of inflection used to mark agreement with the verb in Pocomchí.

[Note: /q/ is a voiceless postvelar stop]

	'help'	'see'		'help'	'see'
I—you	tinitow	tiwil	I—him	initow	inwil
I—them	kinitow	kiwil	You—me	kinatow	kinawil
You—him	inatow	inawil	You—us	qoxatow	qawil
You—them	katow	kawil	He—me	kiritow	kiril
He—you	tiritow	tiril	He—him	iritow	iril
He—us	qoxritow	qoxril	He—them	kiritow	kiril
We—you	tiqatow	tiqil	We—him	inqatow	inqil
We—them	kiqatow	kiqil	They—me	kinkitow	kinkil
They—you	tikitow	tikil	They—him	inkitow	inkil
They—us	qoxkitow	qoxkil	They—them	kikitow	kikil

Hint 1: Like English, Pocomchí makes no distinction between 2nd person singular and plural.

Hint 2: There is one phonological process that affects this data. It results in ambiguities and unexpected forms.

Russian
(Indo-European)

A	B
nabor-.....'type'	naborşčik.....'typesetter
kamen-.....'rock'	kamenşčik.....'stonemason'
časov-.....'watch'	časovşčik.....'watchmaker'
ljot-.....'flight'	ljotčik.....'flier'
peripis-.....'to copy'	peripisčik.....'copyist'
perevod-.....'to translate	perevodčik.....'translator'
boz-.....'to cart'	bozčik.....'carter'
atom-.....'atom'	atomşčik.....'atom-warmonger'
pulemjot-.....'(machine)gun'	pulemjotčik.....'(machine)gunner'
mebel-.....'furniture'	mebelşčik.....'furniture-maker'
beton-.....'concrete'	betonşčik.....'concrete worker'
lom-.....'scrap'	lomşčik.....'salvager'

Spanish (Indo-European)

	Infinitive		Present Indicative	Present Subjunctive	Imperfective Indicative	Past Participle
1.	ablár	'to speak'	ábla	áble	ablába	abládo
2.	sitár	'to cite'	síta	síte	sitába	sitádo
3.	dudár	'to doubt'	dúda	dúde	dudába	dudádo
4.	kemár	'to burn'	kéma	kéme	kemába	kemádo
5.	pensár	'to think'	piénsa	piénse	pensába	pensádo
6.	r̃obár	'to steal'	r̃óba	r̃óbe	r̃obába	r̃obádo
7.	kostár	'to cost'	kuésta	kuéste	kostába	kostádo
8.	bar̃ér	'to sweep'	bár̃e	bár̃a	bar̃ía	bar̃ído
9.	bendér	'to sell'	bénde	bénda	bendía	bendído
10.	perdér	'to lose'	piérde	piérda	perdía	perdído
11.	komér	'to eat'	kóme	kóma	komía	komído
12.	mobér	'to move'	muébe	muéba	mobía	mobído
13.	gañír	'to yelp'	gáñe	gáña	gañía	gañído
14.	suxerír	'to suggest'	suxiére	suxiéra	suxería	suxerído
15.	sentír	'to feel'	siénte	siénta	sentía	sentído
16.	pedír	'to ask for'	píde	pída	pedía	pedído
17.	dormír	'to sleep'	duérme	duérma	dormía	dormído
18.	bruñír	'to burnish'	brúñe	brúña	bruñía	bruñído
19.	sexír	'to follow'	síxe	síga	sexía	sexído

Swahili (Bantu)

1. aliwaandika	He/she wrote you (pl).
2. ninakujua	I know you (sg.)
3. anasoma	He/she reads
4. ulituuliza	You (sg.) asked us.
5. tulikuona	We saw you (sg.)
6. anamjua	He/she knows him/her
7. mtasoma	You (pl.) will read
8. walimpiga	They hit him/her
9. umeandika	You (sg.) have just written
10. mlimpiga	You (pl.) hit him/her
11. ankujua	He/she knows you (sg.)
12. mtaniona	You (pl) will see me
13. nimembusu	I have just kissed him/her
14. walisoma	They read (past)
15. nitawabusu	I will kiss you (pl.)
16. tumewaandika	We have just written you (pl.)
17. utanibusu	You (sg.) will kiss me
18. utanipiga	You (sg.) will hit me
19. wamewauliza	They have just asked you (pl.)
20. tumewauliza	We have just asked you (pl.)
21. nilimwandika	I wrote him/her
22. tulimwona	We saw him/her
23. unamwuliza	You (sg.) ask him/her
24. mwamwandika	You (pl.) write him/her
25. mwasoma	You (pl.) read

Swahili (Niger-Congo)

A feature of Swahili morphology is the presence of several morphological **Noun Classes** (or **Genders**), each represented by a set of affixes which mark number, and occur in agreement with adjectives and verbs.

Organize the following nouns according to the classes (genders) defined by the affixes. For each class, indicate the noun, adjective, and verb agreement markers. List all roots and indicate what classes they belong to. Say whatever you can about the semantic ("meaning") characteristics of each class. What happens when a root is used in several classes? In addition, answer the questions at the end of the next page.

1. miti ..... 'trees'
2. kikapu ..... 'basket'
3. ukubwa ..... 'size'
4. mikono ..... 'arms'
5. mtumiši ..... 'servant'
6. watumiši ..... 'servants'
7. vibanda ..... 'huts'
8. mtende ..... 'date palm'
9. wazee ..... 'old men'
10. mtoto ..... 'child'
11. mkono ..... 'arm'
12. mti ..... 'tree'
13. kiti ..... 'branch/chair'
14. urefu ..... 'length'
15. vikapu ..... 'baskets'
16. kitabu ..... 'book'
17. mtu ..... 'person'
18. mčuŋwa ..... 'orange tree'
19. mičuŋwa ..... 'orange trees'
20. miaka ..... 'years'
21. umoǰa ..... 'unity'
22. visu ..... 'knives'
23. watoto ..... 'children'
24. watu ..... 'people'
25. kisu ..... 'knife'
26. viti ..... 'branches/chairs'
27. miguu ..... 'legs'
28. mguu ..... 'leg'
29. mwaka ..... 'year'
30. kibanda ..... 'hut'
31. mitende ..... 'date palms'
32. uzee ..... 'old age'
33. vitaḃu ..... 'books'
34. mzee ..... 'old man'
35. udogo ..... 'smallness'
36. kitoto ..... 'infant'
37. vitoto ..... 'infants'
38. mwenda ..... 'journey'
39. mienda ..... 'journeys'
40. mwitu ..... 'forest'
41. miitu ..... 'forests'
42. mwana ..... 'son/daughter'
43. waana ..... 'sons/daughters'
44. mwalimu ..... 'teacher'
45. waalimu ..... 'teachers'
46. mizee ..... 'old things'
47. kuenda ..... 'to go'
48. mwaha ..... 'stonemason'
49. kuaha ..... 'to build in stone'
50. ǰiino ..... 'tooth'
51. maino ..... 'teeth'
52. mawe ..... 'stones'
53. ǰiwe ..... 'stone'
54. malimau ..... 'lemons'
55. pera ..... 'guava'
56. embe ..... 'mango'
57. limau ..... 'lemon'
58. mapera ..... 'guavas'
59. maembe ..... 'mangos'
60. uwezo ..... 'power'

Adjective and Verb Agreement:

Mti umeaŋguka. ..... 'A (or the) tree has fallen down.'
Miti imeaŋguka. ..... 'Some (or the) trees have fallen down.'
Kitoto kimečafuka. ..... 'The infant is untidy.'
Vitoto vimečafuka. ..... 'The infants are untidy.'
Mwaka waha. ..... 'The year is over.' (Lit: 'builds in stone')†
Miaka jaha ..... 'The years are over.'
Mtumiši amefika. ..... 'A (or the) servant has arrived.'
Watumiši wamefika. ..... 'Some (or the) servants have arrived.'
Limau amefika. ..... 'A (or the) lemon has arrived.'
Malimau wamefika ..... 'Lemons have arrived.'
Kisu kirefu ..... 'A (or the) long knife'
Visu virefu ..... 'Long knives'
Mtu mvivu ..... 'A lazy person'
Watu wawili ..... 'Two people'
Mti mzuri ..... 'A (or the) fine tree'
Miti mitatu ..... 'Three trees'
J̌iino ǰirefu ..... 'A (or the) long tooth'
Maino marefu ..... 'Long teeth'
Kitabu kimoǰa kitanitoša ..... 'One book will be enough.'
Visu vitatu vinatoša ..... 'Three knives are enough.'

†**Hint**: Assume *-aha* to be the stem meaning 'to be over.'

A. You have just encountered a new word, *mboŋo*, whose meaning you do not yet know. Can you predict its plural form? Why or why not?

B. If Swahili borrowed the English word 'apple' as *apelu*, what would be its likely plural form?

C Can you propose a probable form for a verb meaning, 'to be empowered, to be able'? Can you speculate at a likely Swahili word meaning, 'chiefs' (literally 'powerful ones')?

D. You have just heard a new word, *makopo*. In order to figure out what it means, you decide to ask for one. What form would you use? Explain yourself and any difficulties you might encounter.

Tagalog (Austronesian)

1.	sumalat	write!	16.	ʔumaral	teach!
2.	sumalat	wrote	17.	ʔumaral	taught
3.	susulat	will write	18.	ʔaʔaral	will teach
4.	sumusulat	is writing	19.	ʔumaʔaral	is teaching
5.	sulatin	be written!	20.	ʔaralin	be taught!
6.	sinulat	was written	21.	ʔinaral	was taught
7.	susulatin	will be written	22.	ʔaʔaralin	will be taught
8.	sinusulat	is being written	23.	ʔinaʔaral	is being taught
9.	hahanap	will look for	24.	ʔumibig	love!
10.	hanapin	be sought!	25.	ʔumibig	loved
11.	hinahanap	is being sought	26.	ʔumiʔibig	is loving
12.	hinanap	was sought	27.	ʔiʔibig	will love
13.	bumabasa	is reading	28.	ginawaʔ	was done
14.	bumasag	broke	29.	lumapit	approach!
15.	dumatiŋ	arrived	30.	tinawag	was called

The data consists of 30 inflected verbs, inflected for Voice: Active (e.g. 1, 2, 3, 4, 9,13, etc.), and Passive (e.g. 5, 6, 7, 8, 10, 11, etc.), for Mood: Imperative (e.g. 1, 5, 10, etc.), and for Tense: Past (e.g. 2, 6, 12, etc.), future (e.g. 3, 7, 9, etc.), and present (e.g. 4, 8, 11, etc.). The inflected verbs consist of a root with one or more affixes.

Isolate the roots and list them with an English gloss. List the affixes that are used for each inflected verb type, and indicate how they are attacted to the root:

Supply the forms you would expect for the following glosses:

_____ call!

_____ is calling

_____ approached

_____ will arrive

_____ will be sought

_____ is being called

_____ be done!

_____ was read

Taiwanese (Sino-Tibetan)

[Note: phonemic tone is not indicated]

		'One ...'	'Two ...'
1	'man'	laŋ	cit e laŋ	nəŋ e laŋ
2	'book'	cu	cit e cu	nəŋ e cu
3	'dog'	kau	cit cia kau	nəŋ cia kau
4	'cat'	niau	cit cia niau	nəŋ cia niau
5	'pencil'	eŋ pit	cik ki eŋ pit	nəŋ ki eŋ pit
6	'arm'	c'iu	cik ki c'iu	nəŋ ki c'iu
7	'finger'	ciŋ t'ao a	cik ki ciŋ t'ao a	nəŋ ki ciŋ t'ao a
8	'pen'	pit	cik ki pit	nəŋ ki pit
9	'belt'	k'o tua	cit tiao k'o tua	nəŋ tiao k'o tua
10	'wire'	so a	cit tiao so a	nəŋ tiao so a
11	'tie'	nia tua	cit tiao nia tua	nəŋ tiao nia tua
12	'path'	lo	cit tiao lo	nəŋ tiao lo
13	'stone'	c'io t'au	cit tiap c'io t'au	nəŋ tiap c'io t'au
14	'star'	c'i	cit tiap c'i	nəŋ tiap c'i
15	'egg'	nəŋ	cit tiap nəŋ	nəŋ tiap nəŋ
16	'house'	c'u	cik kieŋ c'u	nəŋ kieŋ c'u
17	'library'	to su kuaŋ	cik kieŋ to su kuaŋ	nəŋ kieŋ to su kuaŋ

Turkish (Altaic)

1.	gördü	He saw.	
2.	görüldü	He was seen.	
3.	görülmedi	He was not seen.	
4.	görüyordu	He was seeing.	
5.	görmedimi	Didn't he see?	
6.	görülmüyoruz	We're not being seen.	
7.	görmeyeǰekmi	Won't he see?	
8.	göreǰektim	I was going to see.	
9.	göreǰekler	They will see.	
10.	görmüštü	He has seen.	
11.	görmemišti	He has not seen.	
12.	ačtı	He opened it.	
13.	ačmıšlardı	They have opened it.	
14.	ačaǰaklar	They will open it.	
15.	ačaǰakmıšım	I will have opened it.	
16.	ačtımı	Did he open it?	
17.	ačmalıydım	I should've opened it.	
18.	ačıyormu	Is he opening it?	
19.	ačmadım	I did not open it.	
20.	yetmedimi	Didn't he reach it?	
21.	yetti	He reached it.	
22.	yetmeliydim	I should have reached it.	
23.	yeteǰekmiyiz	Will we reach it?	
24.	yetmemeli	He should not reach it.	
25.	yetmišti	He has reached it.	
26.	yetiyoruz	We are reaching it.	
27.	kırdı	He broke it.	
28.	kırıyorum	I am breaking it.	
29.	kırılmıštı	It has been broken.	
30.	kırmayaǰakmıyım	Won't I break it?	
31.	kırılmayaǰakmı	Won't it be broken?	
32.	kırmamalıyız	We should not break it.	
33.	kıraǰaktım	I was going to break it.	
34.	yazıyorlar	They are writing.	
35.	yazmalıymıšım	I should have written.	
36.	yazılmamıštı	It has not been written.	
37.	yazaǰakmı	Will he write?	
38.	yazaǰakmıyız	Will we write?	
39.	yazmayordu	He was not writing.	
40.	yazaǰakmıšız	We will have written.	

There are five verb roots in this data: ***gör, ač, yet, kır,*** and ***yaz.***

There are a lot of inflections on these roots. List them **all**, give their meanings, and indicate how they are used together (i.e, deścribe their order of occurrence).

List all the allomorphs for each morpheme and give their conditioning environments, **or** state general rules that predict <u>all</u> the allomorphy.

Note: Ignore contractions in the glosses — they're used only to save space.

Turkish (Altaic)

1. adama 'to the man'
2. adamlardan 'from the men'
3. baš 'head'
4. bašlar 'heads'
5. bašlarımız 'our heads'
6. bašta 'in the head'
7. bašımda 'in my head'
8. čölde 'in the desert'
9. čöller 'deserts'
10. dišim 'my tooth'
11. dišlerde 'in the teeth'
12. dište 'in the tooth'
13. dostlar 'friends'
14. dostumuz 'our friend'
15. dostundan 'from your friend'
16. el 'the hand'
17. elim 'my hand'
18. elimde 'in my hand'
19. eller 'hands'
20. ellerim 'my hands'
21. ellerimde 'in my hands'
22. ellerimiz 'our hands'
23. elleriniz 'your hands'
24. ellerinize 'to your hands'
25. evde 'in the house'
26. evim 'my house'
27. evlerde 'in the houses'
28. evli kadın 'married woman'*
29. gönülden 'sincerely'*
30. gönüllerimiz 'our hearts'
31. süt 'milk'
32. gönülüm 'my heart'
33. gözde 'in the eye'
34. gözlerim 'my eyes'
35. gözleriniz 'your eyes'
36. gözüm 'my eye'
37. gururlu 'haughty'
38. gururun 'your pride'
39. günler 'days'
40. günlü 'daily'
41. gülüm 'my rose'
42. gülün 'your rose'
43. güller 'roses'
44. kadınlara 'to the women'
45. seste 'in the voice'
46. kirli el 'dirty hand'
47. kızlarım 'my girls'
48. kızım 'my girl'
49. kollarımız 'our arms'
50. kolum 'my arm'
51. kollarından 'from your arms'
52. kušlar 'birds'
53. kušlarım 'my birds'
54. kušum 'my bird'
55. penjerede 'in the window'
56. pulum 'my postage stamp'
57. pullarım 'my postage stamps'
58. sesim 'my voice'
59. sesleriniz 'your voices'
60. süte 'to the milk'

Turkish (Altaic)

61. sütte 'in milk'
62. sütten 'from the milk'
63. sütüm 'my milk'
64. sütünüz 'your milk'
65. yaš 'age'
66. yašɨm 'my age'
67. yedi adam 'seven men'
68. yedi kuš 'seven birds'
69. yüzün 'your face'
70. yüzleriniz 'your faces'
71. zilim 'my bell'
72. zilin 'your bell'
73. ziller 'bells'
74. eli 'his hand'
75. sütü 'his milk'
76. yašɨ 'his age'
77. kolu 'his arm'
78. čoǰukları 'his children'
79. kitap 'book'
80. yüksek sesli adam
'man with a loud voice'
81. kitabɨm 'my book'
82. aačlar 'trees'
83. aaǰɨn 'your tree'
84. kitaplar 'books'
85 čoǰuu 'his child'
86. čoǰuum 'my child'
87. kitaba 'to the book'
88. kitapta 'in the book'
89. kitaptan 'from the book'
90. čoǰua 'to the child'
91. čoǰuktan 'from the child'
92. aaǰa 'to the tree'
93. aačta 'in the tree'
94. aač 'tree'
95. köpekler 'dogs'
96. köpei 'his dog'
97. čoǰuk 'child'
98. bašlarɨnɨz 'your heads'
99. kušlarɨn 'your birds'
100. yedi penǰereli ev
'house with seven windows'

- The forms marked with an asterisk are idioms, though there should be very little difficulty figuring out how they work.
- There are two kinds of vowel harmony in Turkish; each affix participates in only one kind.
- There are several kinds of consonant variation between morphemes. Is there a general principle that describes them all?
- There is one derivational affix in the data.
  Which is it?
  What is it used for (approximately)?
  What are its variants?

Turkish Nouns 2

1) gözü 'his eye'
2) gözlerim 'my eyes'
3) gözünde 'in your eye'
4) gönülümde 'in my heart'
5) kitabınız 'your[pl] book'
6) dišim 'my tooth'
7) dišlerim 'my teeth'
8) adamları 'his men'
9) bašlarımız 'our heads'
10) gülüm 'my rose'
11) dostlar 'friends'
12) dostumuz 'our friend'
13) dostlarınız 'your[pl] friends'
14) elleri 'his hands'
15) elim 'my hand'
16) kušlarım 'my birds'
17) kušu 'his bird'
18) kadını 'his woman
19) kadınların 'your women
20) güllerim 'my roses'

Given the following noun roots:

a) ses 'voice'
b) yaš 'age'
c) gün 'day'
d) kol 'arm'
e) zil 'bell'
f) kız 'girl'
g) pul 'stamp'
h) čöl 'desert',

form the following inflected nouns:

my voice_____ my voices _____

his age_____ our ages_____

your day_____ our days_____

his arm_____ his arms_____

your[pl] bell_____ his bells_____

your girl_____ your[pl] girls_____

his stamp_____ my stamps_____

my desert_____ our deserts_____

Morphology
Morphemes
Allomorphs

E.g: English Noun Plural

Morpheme: {-Z_1}

Allomorphs: /-əz/, /-z/, /-s/

Conditioning environments

{-Z_1}→ /-əz/ after sibilants *

{-Z_1}→ /-s/ after vl segments

{-Z_1}→ /-z/ elsewhere

*NB: This rule precedes the others, since it has the most restrictive environment.

Alternatively, this morpheme may be treated as having only two allomorphs, /-z/ and /-s/, with the /-əz/ form resulting from an English rule of epenthesis that inserts a /-ə-/ to separate the final sibilant from the suffix (which also contains a sibilant)

Since /ə/ is voiced (like all English vowels), it will then automatically take the /-z/ allomorph.

Phonology
Phonemes
Allophones

E.g: English Bilabial Stop

Phoneme: /p/

Allophones: [p^h], [$p^¬$], [p]

Conditioning environments

/p/→ [p^h] / #__V_{stress}

/p/→ [$p^¬$] word-finally (optional)

/p/→ [p] elsewhere

Alternatively, the allophony of this phoneme may be subsumed under the general rule that aspirates initial voiceless stops in English (i.e, /t/, /č/, and /k/ also have aspirated allophones in the same environments).

CONSONANT CHART

	Bilabial	LabioDental	IntDental	Alveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Nasals	m	(ɱ)		n	ɳ	ɲ [ñ]	ŋ	(ɴ)		
Plain Stops	p/b			t/d	ṭ/ḍ		k/g	q[ḳ]/ɢ		ʔ
(Implosives	ɓ			ɗ			ɠ)			
Ejectives	p̓			t̓			k̓	q̓ [ḳ̓]		
Fricatives	ɸ/β	f/v	θ/ð	s/z	ṣ/ẓ	ʃ/ʒ [š/ž]	x/ɣ	χ[x̣]/ʁ	ħ/ʕ	
Affricates				tˢ/dᶻ [c/j]		tʃ/dʒ [č/ǰ]				
Lateral Obstruents				ɬ/ɮ		tɬ/dɮ [ƛ/λ]				
Lateral Resonants				l	ɭ	ʎ [ḷ]	ɫ			
Semivowels	w				ɹ [ɚ]	y [j]	w		h	
Trills				r̃				ʀ̃		
Tap or Flap				ɾ [ɒ]	ɽ [ɒ̣]					

ʼk, kʷ, tʸ [=ţ,c], kʰ, t̓ˢ [=č̓], t̓ɬ [=ƛ̓], k͡p, ŋ̊, ɳ̥, m̥, ɾ̥; ç [≠š] = flat pal fric

VOWEL CHART

Front	Central	Back		Front	Central	Back
i	ɨ	ɯ [ï]	**High**	y [ü]	ʉ	u
ɩ [ɪ]			<–Lax–>	ʏ [ü, ü]		ʊ [ʊ, ʊ]
e	ə	(ɤ [ë])	**Mid**	ø [ö]	(ɵ)	o
ɛ	ʌ		<–Lax–>	œ [ɔ̈]		ɔ
æ	a	ɑ	**Low**	(ɶ		ɒ)

Unrounded **Rounded**

aᶦ [=aᴵ, aʸ], aᵘ [=aᵁ, aʷ], ɔᶦ [=ɔᴵ, ɔʸ, oᴵ, oʸ, oᶦ], u̥, õ [=ǫ, ǫ], y̥ [=w], ɪ̥ [=y], ɽ̥ [=ɚ]

THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap				ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	ʼ	as in:
ǀ	Dental	ɗ	Dental/alveolar	pʼ	Bilabial
ǃ	(Post)alveolar	ʄ	Palatal	tʼ	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	kʼ	Velar
ǁ	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

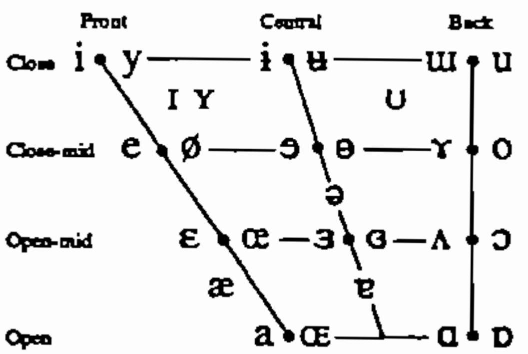
SUPRASEGMENTALS

ˈ	Primary stress	ˌfoʊnəˈtɪʃən
ˌ	Secondary stress	
ː	Long	eː
ˑ	Half-long	eˑ
˘	Extra-short	ĕ
.	Syllable break	ɹi.ækt
|	Minor (foot) group	
‖	Major (intonation) group	
‿	Linking (absence of a break)	

TONES & WORD ACCENTS

LEVEL			CONTOUR		
e̋ or	˥	Extra high	ě or	˩˥	Rising
é	˦	High	ê	˥˩	Falling
ē	˧	Mid	e᷄	˦˥	High rising
è	˨	Low	e᷅	˩˨	Low rising
ȅ	˩	Extra low	e᷈	˧˦˧	Rising-falling etc.
↓	Downstep		↗	Global rise	
↑	Upstep		↘	Global fall	

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

OTHER SYMBOLS

ʍ Voiceless labial-velar fricative

w Voiced labial-velar approximant

ɥ Voiced labial-palatal approximant

ʜ Voiceless epiglottal fricative

ʢ Voiced epiglottal fricative

ʡ Epiglottal plosive

ɕ ʑ Alveolo-palatal fricatives

ɺ Alveolar lateral flap

ɧ Simultaneous ʃ and x

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.

k͡p t͡s

DIACRITICS

Diacritics may be placed above a symbol with a descender, e.g. ŋ̊

̥	Voiceless	n̥ d̥	̤	Breathy voiced	b̤ a̤	̪	Dental	t̪ d̪
̬	Voiced	s̬ t̬	̰	Creaky voiced	b̰ a̰	̺	Apical	t̺ d̺
ʰ	Aspirated	tʰ dʰ	̼	Linguolabial	t̼ d̼	̻	Laminal	t̻ d̻
̹	More rounded	ɔ̹	ʷ	Labialized	tʷ dʷ	̃	Nasalized	ẽ
̜	Less rounded	ɔ̜	ʲ	Palatalized	tʲ dʲ	ⁿ	Nasal release	dⁿ
̟	Advanced	u̟	ˠ	Velarized	tˠ dˠ	ˡ	Lateral release	dˡ
̠	Retracted	i̠	ˤ	Pharyngealized	tˤ dˤ	̚	No audible release	d̚
̈	Centralized	ë	̴	Velarized or pharyngealized	ɫ			
̽	Mid-centralized	e̽	̝	Raised	e̝ (ɹ̝ = voiced alveolar fricative)			
̩	Syllabic	n̩	̞	Lowered	e̞ (β̞ = voiced bilabial approximant)			
̯	Non-syllabic	e̯	̘	Advanced Tongue Root	e̘			
˞	Rhoticity	ɚ	̙	Retracted Tongue Root	e̙			

L'ASSOCIATION PHONÉTIQUE INTERNATIONALE (INTERNATIONAL PHONETIC ASSOCIATION)

This Association was inaugurated in 1886 by a small group of language teachers in France who had found the practice of phonetics useful in their work and wished to popularize the methods. It was first known as The Phonetic Teachers' Association, changing to its present title in 1897.

One of the first activities of the Association was to produce a journal in which the contents were printed entirely in phonetic transcription. The idea of establishing a phonetic alphabet was first proposed by Otto Jespersen (1869–1943) in 1886, and the first version of the International Phonetic Alphabet (IPA) was published in August 1888. Its main principles were that there should be a separate letter for each distinctive sound, and that the same symbol should be used for that sound in any language in which it appears. The alphabet was to consist of as many roman alphabet letters as possible, using new letters and diacritics only when absolutely necessary. These principles continue to be followed today.

The IPA has been modified and extended several times, and is now widely used in dictionaries and textbooks throughout the world. Some of its special letters have even been accepted as part of the new orthographies devised for previously unwritten languages, such as in certain parts of Africa.

Paul Passy, founder of the International Phonetic Association

The contents page to the last number of *Le Maître Phonétique*, which appeared in 1970. The headings are in French, the official language of the Association. Each article has been written in a transcription that partly reflects the pronunciation of the author. For example, Soravia uses [ou] to represent the diphthong found in such words as *know* ([founetiks] = *phonetics*), whereas Lewis uses [əu] (as in [təunl] = *tonal*) and Fox uses [aʊ] ([taʊn] = tone). The asterisk is used before a word that is a proper name.

ðə laːst m.f.

əz membəz wil nəu, ðis iz ðə laːst nʌmbər əv ði m.f. in its preznt fɔːm. aː dʒəːnl waz pʌbliʃt fə ðə fəːst taim in 1889, ðəu priːvjəsli, from 1886, it əd apiəd əz " ðə fənetik tiːtʃə ". in 1889, aːr əsəusieiʃn hæd 321 membəz in 18 kʌntriz, ðə mədʒɔrəti kʌmiŋ from *swiːdn, *dʒəːməni ən *fraːns. tədei, wiː hæv mɔː ðn 800 membəz in əuvə 40 kʌntriz, ðə greit mədʒɔrəti kʌmiŋ fram ðə *junaitid steits ən *greit britn.

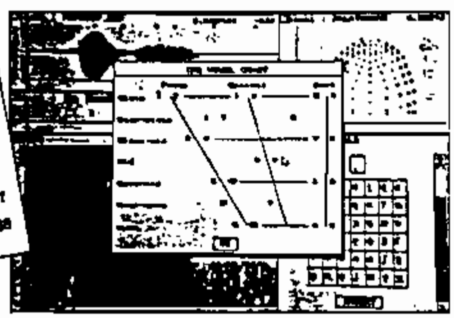
nau ðət wiː əv disaidid tə print aː njuː *Journal* in ɔːθɔgrəfi, fə ðə fəːst taim in dʒuːn 1971, it iz həupt ðət ðə riːdəʃip wil bi inlaːdʒd ən ðət kontribjuːʃnz wil bi risiːvd fram ə waidə səːkl əv fəunitiʃnz ən tiːtʃəz. məust əv aː membəz huː əv riplaid tə ðə səːkjələr in ðə laːst m.f. həv signifaid ðət ðei wiʃ tə kəntinjuː tə səbskraib tə ðə njuː *Journal*. ðəuz huː əv not jet infɔːmd əs əv ðeər intenʃnz ar əːdʒd tə duː səu wiðout dilei, sins aː faineənsiz wil not əlau əs tə send ðə *Journal* tə fɔːmə membəz huːz səbskripʃnz ə not riinjuːd.

wi ikspekt ðə njuː *Journal* tə kəntein əbaut 50 peidʒiz ət ði autset. fə ðis riːzn, in ðə fəːst nʌmbəz ət liːst, wiː wil limit ðə leŋkθ əv kontribjuːʃnz tu ə mæksiməm əv əbaut 3,000 wəːdz. ðə foləuiŋ nəuts fə kəntribjutəz giv ən indikeiʃn əv ðə rikwaiəmənts əv prezənteiʃn fə ðə *Journal*; ðei wil in fjuːtʃə bi printid on ðə *Journals* kʌvə.

The Association Secretary's statement explaining the demise of *Le Maître Phonétique*.

The notice, which appeared in the 1970 issue, was headed 'The last m.f.': 'As members will know, this is the last number of the m.f. in its present form. Our journal was published for the first time in 1889, though previously, from 1886, it had appeared as 'The Phonetic Teacher'. In 1889, our association had 321 members in 18 countries, the majority coming from Sweden, Germany and France. Today, we have more than 800 members in over 40 countries, the great majority coming from the United States and Great Britain.

Now that we have decided to print our new *Journal* in orthography, for the first time in June 1971, it is hoped that the readership will be enlarged and that contributions will be received from a wider circle of phoneticians and teachers ...'



IPA on screen An IPA transcription tutorial, using a multimedia environment of the Computerized Speech Lab (p. 135). When students are unsure of a transcription, the vowel or consonant chars can be displayed, which speaks each phone and provides a spectrographic display with a click of the mouse.

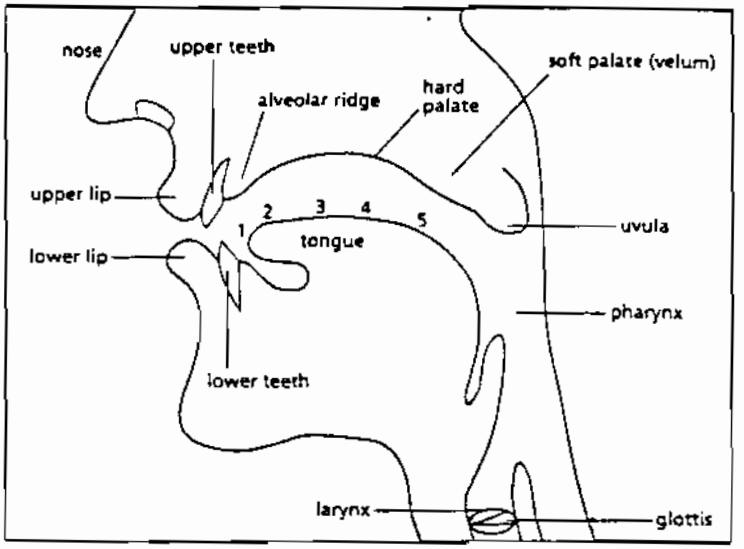
17 · THE SOUND SYSTEM

We are used to seeing the written language as a sequence of letters, separated by small segments of space. This is how we were taught to write. We formed our letters one at a time, then slowly and painstakingly brought them together in 'joined-up' writing. We learned to call five of these letters 'vowels' (A, E, I, O, U), and the others 'consonants'. We may also have learned that letter Y is also 'sometimes' used as a vowel.

Everyone born with the normal capacity to learn acquires the ability to listen and speak long before the ability to read and write. Moreover, when the English alphabet was first devised (p. 258), its letters were based on a consideration of the nature of the sounds in Old English. The origins of the written language lie in the spoken language, not the other way round. It is therefore one of life's ironies that traditionally in present-day education we do not learn about spoken language until well after we have learned the basic properties of the written language. As a result, it is inevitable that we think of speech using the frame of reference which belongs to writing. We even use some of the same terms, and it can come as something of a shock to realize that these terms do not always have the same meaning.

THE ORGANS OF ARTICULATION

The diagram shows the anatomical location of the vocal organs involved in the description of English vowels and consonants. It is not a complete representation of all the vocal organs – the lungs, for example, are not shown.



Key

1 tongue *tip*

2 *blade* of the tongue (the tapering part, opposite the alveolar ridge)

3 *front* of the tongue (opposite the hard palate)

4 *centre* of the tongue (opposite where the hard and soft palate meet)

5 *back* of the tongue (opposite the soft palate)

A BASIC PERSPECTIVE

Pronunciation can always be studied from two points of view: the *phonetic* and the *phonological*

Phonetics

Phonetics is the study of the way humans make, transmit, and receive speech sounds. It is divided into three main branches, corresponding to these three distinctions:

- *articulatory phonetics* is the study of the way the vocal organs are used to produce speech sounds
- *acoustic phonetics* is the study of the physical properties of speech sounds
- *auditory phonetics* is the study of the way people perceive speech sounds

This section gives details of the articulation of vowels and consonants, and makes only passing mention of their acoustic characteristics and the mechanisms of audition. The auditory perspective is more in evidence in the section on prosody (p. 248).

Phonology

Phonology is the study of the sound systems of languages, and of the general properties displayed by these systems. By contrast with phonetics, which studies *all* possible sounds that the human vocal apparatus can make, phonology studies only those contrasts in sound (the *phonemes*) which make differences of meaning within language. When we listen carefully to the way people speak English, we will hear hundreds of slight differences in the way individuals pronounce particular sounds. For example, one person may pronounce /s/ in a noticeably 'slushy' manner, while another may pronounce it in a 'lisping' manner. A phonetician would be interested in describing exactly what these differences of articulation are. A phonologist, however, would point out that both articulations are 'types of /s/': /seɪ/, no matter how the /s/ varies, it continues to contrast with /beɪ/, /meɪ/, and other words. There is just one basic unit, or phoneme, involved.

When we talk about the 'sound system' of English, we are referring to the number of phonemes which are used in a language, and to how they are organized. To say there are '20 vowels' in a particular accent means that there are 20 units which can differentiate word meanings: /e/ is different from /iː/, for example, because there are pairs of words (such as *set* and *seat*) which can be distinguished solely by replacing one of these vowels by the other. All the vowels in the list on p. 237 (and all the consonants on p. 242) owe their existence to this principle.

Brackets

To help separate the two ways of looking at pronunciation, the practice has grown up in linguistics of using different kinds of brackets for the two approaches. Square brackets – [ ] – are used when sounds are being discussed from a phonetic point of view – that is, purely as sounds, and regardless of their role in the sound system of the language. Slant brackets – // – are used when sounds are being discussed from a phonological point of view – that is, purely as part of the sound system, and regardless of the particular way they are articulated. For the most part, transcriptions in this book are phonological: they show the phonemes, and use slant brackets, as in /pen/ *pen* and /skruː/ *screw*. When the discussion focuses on points of articulatory detail, however, as in the description of regional differences of pronunciation, we will need to rely as well on a phonetic transcription.

SPEAKING WITHOUT THE LUNGS

The vowels and consonants of English, as of most languages, are all made using pulmonic egressive air. But there are several other types of speech sound which do not use an air-stream from the lungs, and these are encountered in many languages of the world.

CLICKS

One of the most distinctive types of non-pulmonic sound is the click. Click sounds are sharp, suction noises, made by the tongue or lips. For example, the noise we write as *tut tut* (or *tsk tsk*) is a pair of click sounds, made by the tongue against the top teeth. While making a click sound, it is possible to breathe in and out, quite independently, showing that the lungs are not involved in their production.

In European languages, isolated click sounds are often heard as meaningful noises, but they are not part of their system of vowels and consonants (§28). The *tut tut* click, for example, expresses disapproval in English, but the sound is not used as part of a word, in the way that /t/ and /p/ are. However, in many other languages, clicks are used as consonants. Most well known are some of the languages of southern Africa, often referred to as 'click languages'. !Xũ is one such language, with as many as 48 clicks (p. 170). The Khoisan languages, which include the languages of the Khoikhoin (Hottentot) and San (Bushmen) tribes, have the most complex click systems, using many different places of articulation in the mouth, and involving the simultaneous use of other sounds made in the throat or nose.

GLOTTALIC SOUNDS

The space behind the Adam's apple, between the vocal folds, is known as the *glottis*. We can use the glottis to start an air-stream moving, and several languages make use of sounds based on this principle, referred to as the *glottalic* air-stream mechanism. When the glottis makes the air move inwards, the sounds are called *implosives*. An implosive consonant is a glottalic ingressive sound. When the air is made to move outwards, the sounds are called *ejectives*. An ejective consonant is a glottalic egressive sound.

Implosive consonants occur in many languages, but are particularly common in American Indian and African languages (such as Shona and Ijo). Ejective consonants are widely used in the languages of the Caucasian family, and also in many American Indian and African languages (such as Hausa and Amharic). They may even be heard in certain accents and styles of English. Speakers from the north of England quite often use them at the ends of words, in place of the usual pulmonically produced [p], [t], or [k]. And regardless of the accent we use, if we speak in a tense, clipped manner, these sounds will often be 'spat' out at the end of a word.

Miriam Makeba Her recordings of 'click songs' were popular in the 1960s. A native speaker of Xhosa, she used words containing click consonants in her songs, achieving notable effects by articulating them with great resonance

HOW CLICK SOUNDS ARE MADE

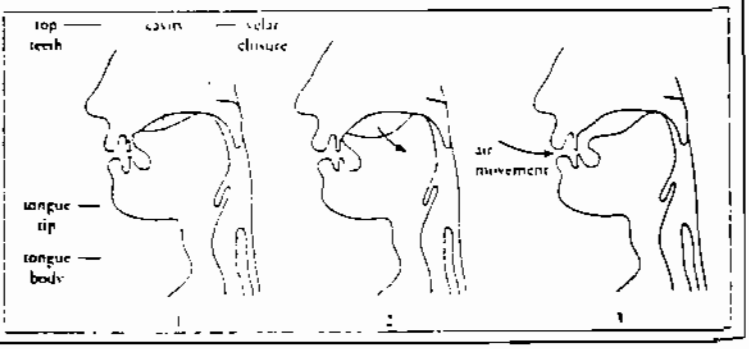
A click sound is produced solely in the mouth. The air flow is controlled by movements which take place against the back part of the roof of the mouth, known as the *velum* (p. 130). Because of this, click sounds are described as using a *velaric* air-stream mechanism.

Tut-tut is an example of a double *dental* click (phonetic symbol [ǀ]), because the teeth have been involved in its production. A single dental click is widely used as a noise expressing negation throughout the Near East. *Lateral* clicks (phonetic symbol [ǁ]) are made with the sides of the tongue, and are heard in the noises of encouragement to horses or other animals (including the human). A click made against the alveolar ridge is symbolized by [!]. A click sound made at the lips would be known as a *bilabial* click – made with the lips puckered, it is often used as a 'kiss at a distance'. There are six clicks recognized on the IPA chart (p. 161).

1. The back of the tongue is raised so that it presses against the velum. At the same time, a closure is made at the front of the mouth, using the tongue or lips. This forms a cavity in the mouth, cut off from the air outside.

2. The body of the tongue is moved slightly downwards and backwards, so as to form a partial vacuum inside the cavity.

3. When the tongue is suddenly lowered, or the lips opened, air rushes in from outside, to produce the sound we hear as a click.



HOW EJECTIVE SOUNDS ARE MADE

The essential feature of an ejective sound is that the glottis is tightly closed, so that no air can get to or from the lungs. We are, in effect, 'holding our breath' for a brief moment.

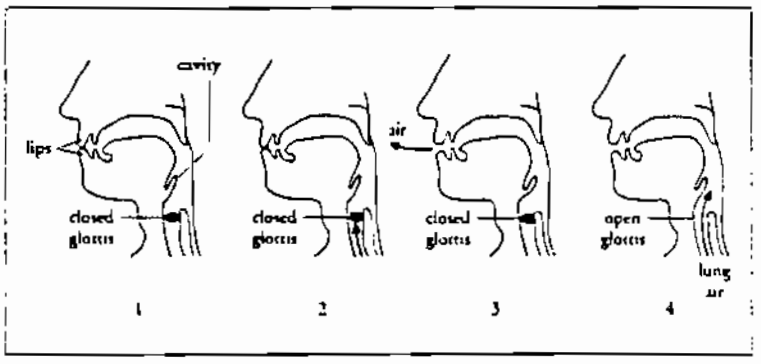
1. At the same time as the glottis closes, we make ready to articulate a consonant sound – for [p'] we close the lips, for [t'] or [k'] we raise the tongue. A body of air is thus trapped in the cavity between the glottis and the closure higher up the vocal tract.

2. We contract some of the muscles of the larynx, so as to make the glottis move in an upwards direction – a movement which compresses the air in the cavity.

3. The increased pressure is suddenly released by removing the closure in the mouth – opening the lips, or lowering the tongue – and the sound 'pops' out.

4. The glottis opens, and lung air rushes up the vocal tract, to act as a source of power for the next speech sound.

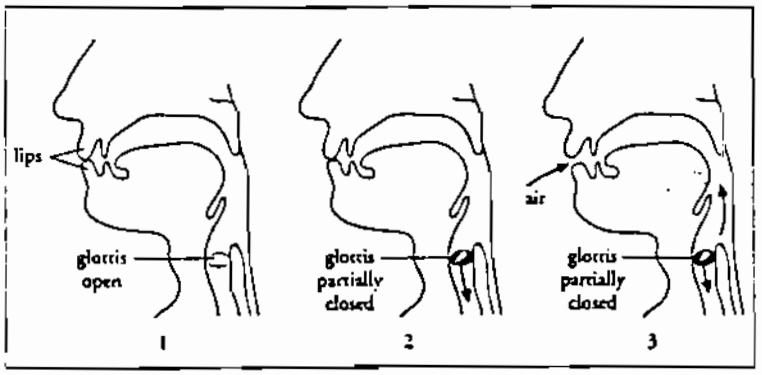
The whole process, from initial glottal closure to final glottal release takes on average only a twentieth of a second, though there is a great deal of timing variation among languages. There are six ejectives recognized on the IPA chart (p. 161).



HOW IMPLOSIVE SOUNDS ARE MADE

Implosive sounds use a process that is to a large extent the reverse of that used for ejectives.

1. We make a closure in the vocal tract – for [ɓ] at the lips, for [ɗ] or [ʄ] with the tongue. Note the special phonetic symbols, to distinguish these sounds from pulmonic [b], [d], and [g].
2. The muscles of the larynx are used to partially close the glottis, and move it in a downwards direction, so that air pressure in the cavity above the glottis is somewhat reduced. The glottis is not closed completely (unlike ejective sounds), so that a certain amount of lung air is still able to move between the vocal folds, causing them to vibrate.
3. When we open the lips, or lower the tongue, we release the vocal tract closure, and outside air is sucked into the mouth. This mixes with the lung air in the glottis, to produce a sound which has a muffled, hollow resonance. There are ten implosives recognized on the IPA chart (p. 161).



OTHER TYPES OF SOUND

The vocal tract can produce many other kinds of sound, but they do not seem to be used with any regularity in spoken language. Scraping the teeth together, flapping the tongue against the floor of the mouth, or making a sucking noise with the tongue against the inside of the cheek – sounds like these are perceived as idiosyncrasies of the speaker. The listener does not usually interpret them as attempts at communication.

On the other hand, other air-stream mechanisms are occasionally used when people communicate. A velaric egressive sound (the same mechanism as for a click, but with the sound sent outwards rather than sucked inwards), made with the lips, is fairly common in French, where, along with a distinctive hand gesture and shrug of the shoulders, it means roughly 'I couldn't care less' or 'It's not my fault.' The similar sound, but with the tongue protruding slightly, is a signal of contempt in many languages – what in Britain is called a 'raspberry'.

Abnormal air-stream mechanisms are also used in special circumstances. It is possible to compress air within the cheek-space and use it to carry speech – so-called *buccal* voice, most well-known through the voice of Walt Disney's Donald Duck. It is also possible to make sounds using air rising from the stomach or oesophagus (the pipe leading from the pharynx to the stomach), as in a belch. *Oesophageal* voice is used in a sophisticated way by many people whose diseased larynx has been surgically removed (p. 278).

It is usual for a language to use only one or two air-stream mechanisms for the production of vowels and consonants. All languages make use of pulmonic egressive air. Glottalic egressive air (for ejectives) is also widely used (though not in European languages). Glottalic ingressive air (for implosives) is much rarer; and velaric air (for clicks) is used only in a small number of African languages. It is uncommon to find a language using more than one or two of these mechanisms regularly. A few languages use three. Damin, a ritual language of a north Australian aboriginal tribe, the Lardil, is unique in that it is reported to use no fewer than five air-stream mechanisms. Pulmonic egressive, glottalic egressive, and velaric ingressive sounds are used, but this language also has a pulmonic *ingressive* [l] sound, and a velaric *egressive* [p] sound. No other languages have been discovered with consonants involving these latter types of sound, which has led some scholars to speculate that perhaps the sound system of this language was specially invented to perform some ritual function.

CONSONANTS

Consonants are normally described with reference to six criteria.

- The source of the air stream – whether from the lungs (*pulmonic*) or from some other source (*non-pulmonic*) (pp. 124–7).
- The direction of the air stream – whether moving outwards (*egressive*) or inwards (*ingressive*) (pp. 126–7).
- The state of vibration of the vocal folds – whether vibrating (*voiced*) or not (*voiceless*) (p. 128).
- The position of the soft palate – whether raised (*oral*) or lowered (*nasal*) (p. 130).
- The place of articulation in the vocal tract.
- The manner of the articulation.

Sounds using non-pulmonic and ingressive air streams (clicks, ejectives, and implosives) are described on pp. 126–7. The present section therefore deals largely with pulmonic egressive sounds, which in fact constitute the vast majority of the sounds of speech. Within the remaining criteria, place and manner of articulation provide the main possibilities for consonant variation.

PLACE OF ARTICULATION

Two reference points are involved in defining consonantal places of articulation: the part of the vocal tract that moves (the 'active' articulator) and the part with which it makes contact (the 'passive' articulator) (p. 130). Eleven possible places are used in speech, as indicated in the figure. (A full list of phonetic symbols is given on p. 161 and in Appendix II.)

1. Bilabial. Both lips are involved in the articulation, e.g. [p], [b], [m].

2. Labio-dental. The lower lip articulates with the upper teeth, e.g. [f], [v].

3. Dental. The tongue tip and rims articulate with the upper teeth, e.g. [θ], [ð], as in *thin* and *this* respectively.

4. Alveolar. The blade (and sometimes the tip) of the tongue articulates with the alveolar ridge (p. 130), e.g. [t], [s]. Sounds articulated at the rear of this ridge (e.g. [ɹ], as in some pronunciations of *red*) are sometimes classified separately as *post-alveolar*.

5. Retroflex. The tip of the tongue is curled back to articulate with the area between the rear of the alveolar ridge and the front of the hard palate, e.g. [ɻ], [ʈ], as heard in many Indian English accents.

6. Palato-alveolar. The blade (and sometimes the tip) of the tongue articulates with the alveolar ridge, with a simultaneous raising of the front of the tongue towards the hard palate, e.g. [ʃ], [ʒ], as in *shoe* and French *je* respectively.

7. Palatal. The front of the tongue articulates with the hard palate, e.g. [ç], [ɟ], as in German *ich* and *ja* respectively.

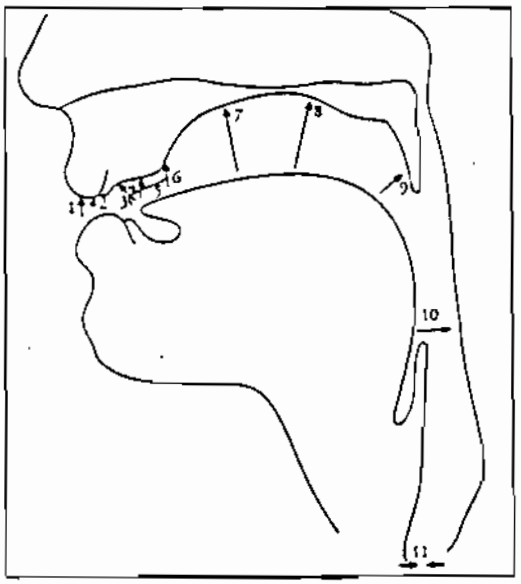
8. Velar. The back of the tongue articulates with the soft palate, e.g. [k], [g].

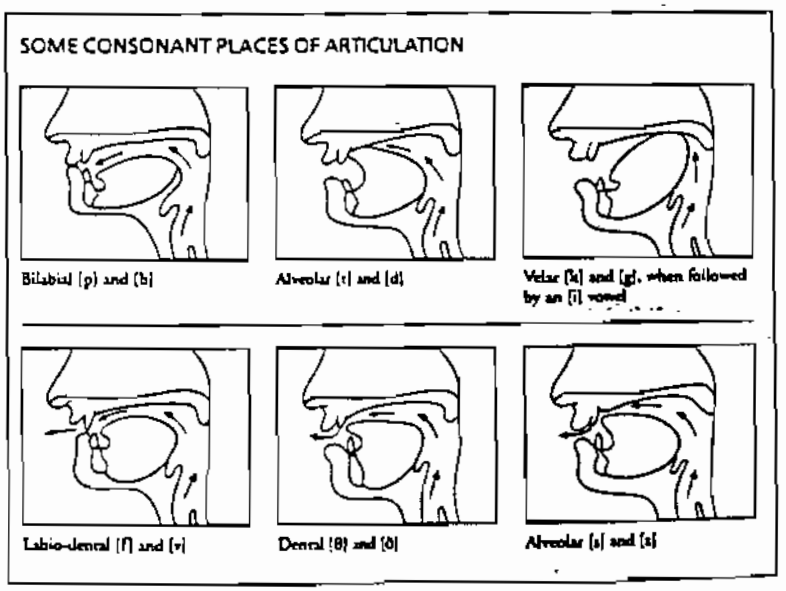
9. Uvular. The back of the tongue articulates with the uvula, e.g. [ʀ], as in French *rue* (certain accents).

10. Pharyngeal. The front wall of the pharynx (in the region of the epiglottis) articulates with the back wall, e.g. [ħ], [ʕ], both found in Arabic.

11. Glottal. The vocal folds come together to cause a closure or friction, e.g. [h], [ʔ] (the glottal stop, p. 128) – a rather different method of articulation from any of the other consonants.

Other ways of describing articulation, in the context of phonology, are discussed in §28.





28 · THE LINGUISTIC USE OF SOUND

Phonetics is the study of how speech sounds are made, transmitted, and received (§27). It is a subject that requires as its source of data a human being with an intact auditory mechanism and a functioning set of vocal organs. The person's particular language background is not strictly relevant: phoneticians would draw the same conclusions about the production and reception of speech whether they were dealing with speakers of English, Hindi, or Chinese. Although the categories outlined in §27 can be used for the analysis of any language, that section provides no information about the way these categories are actually used, in the languages of the world.

By contrast, the primary aim of *phonology* is to discover the principles that govern the way sounds are organized in languages, and to explain the variations that occur. A common methodology is to begin by analysing an individual language, to determine which sound units are used and how they pattern – the language's 'phonological structure'. The properties of different sound systems are then compared, and hypotheses developed about the rules underlying the use of sounds in particular groups of languages, and ultimately in all languages ('phonological universals', §14).

The distinction between phonetics and phonology can be seen from a second point of view. The human vocal apparatus can produce a very wide range of sounds; but only a small number of these are used in a language to construct all of its words and sentences. Phonetics is the study of all possible speech sounds; phonology studies the way in which a language's speakers systematically use a selection of these sounds in order to express meaning.

There is a further way of drawing the distinction. No two speakers have anatomically identical vocal tracts, and thus no-one pronounces sounds in exactly the same way as anyone else (a motivation for the study of voiceprints, §6). There is even a considerable amount of variation in the sounds of a single speaker. Yet when using our language we are able to discount much of this variation, and focus on only those sounds, or properties of sound, that are important to the communication of meaning. We think of our fellow-speakers as using the 'same' sounds, even though acoustically they are not. Phonology is the study of how we find order within the apparent chaos of speech sounds.

In its search for significant generalizations about sound systems, phonology is continually looking beneath the 'surface' of speech, to determine its underlying regularities, and to establish how these relate to other areas of language, notably syntax and morphology (§16). Much of present-day phonological theory is thus concerned with the various kinds of abstract representation it is necessary to set up in order to explain the range and distribution of phonetic segments found in languages. And in the context of generative linguistics (p. 413), there is an even more ambitious aim: to arrive at phonological analyses that have a demonstrable mental reality for the language users (p. 163).

PHONEMES

Phonological analysis relies on the principle that certain sounds cause changes in the meaning of a word or phrase, whereas other sounds do not. An early approach to the subject used a simple methodology to demonstrate this. It would take a word, replace one sound by another, and see whether a different meaning resulted. For example, we hear *pig* in English as consisting of three separate sounds, each of which can be given a symbol in a phonetic transcription, [pɪg]. If we replace [p] by, say, [b], a different word results: *big*. [p] and [b] are thus important sounds in English, because they enable us to distinguish between *pig* and *big*, *pan* and *ban*, and many more word pairs.

In a similar way, [ɪ] and [e] can be shown to be important units, because they distinguish between *pig* and *peg*, *pin* and *pen*, and many other pairs. And so we could continue, using this technique – the 'minimal pairs' test – to find out which sound substitutions cause differences of meaning. The technique has its limitations (it is not always possible to find pairs of words illustrating a particular distinction in a language), but it works quite well for English, where it leads to the identification of over 40 important units. In the earliest approach to phonological analysis, these 'important units' are called *phonemes*.

Phonemes are transcribed using the normal set of phonetic symbols (p. 161), but within slant lines, not square brackets – /p/, /b/, /ɪ/, etc. This shows that the units are being seen as part of a language, and not just as physical sounds.

Allophones

In working out the inventory of phonemes in a language, using this approach, we soon come across sounds that do not change the meaning when we make a substitution. For example, the consonants at the beginning of *shoe* and *she* have very different sound qualities (p. 158). For *shoe*, the lips are rounded, because of the influence of the following [u] vowel; for

SOME MINIMAL PAIRS FOR ENGLISH PHONEMES (SOUTHERN BRITISH)

Vowels

/iː/ – /ɪ/	seat – sit
/ɪ/ – /e/	sit – set
/e/ – /a/	set – sat
/a/ – /ʌ/	cat – cut
/ʌ/ – /ɑː/	cut – cart
/ɑː/ – /ɒ/	cart – cot
/ɒ/ – /ɔː/	cot – caught
/ɔː/ – /ʊ/	cord – could
/ʊ/ – /uː/	pull – pool
/uː/ – /ɜː/	pool – pearl
/ɜː/ – /eɪ/	pearl – pale
/eɪ/ – /aɪ/	day – die
/aɪ/ – /ɔɪ/	buy – boy
/ɔɪ/ – /əʊ/	toy – toe
/əʊ/ – /aʊ/	hoe – how
/aʊ/ – /ɪə/	now – near
/ɪə/ – /eə/	tear (noun) – tear (verb)
/eə/ – /ʊə/	tear – tour
/ʊə/ – /iː/	sure – she
/ə/ – zero	waiter – wait

Consonants

/p/ – /b/	pig – big
/b/ – /t/	bee – tea
/t/ – /d/	tin – din
/d/ – /k/	din – kin
/k/ – /g/	cap – gap
/g/ – /h/	gag – hag
/h/ – /m/	hen – men
/m/ – /n/	map – nap
/n/ – /ŋ/	sin – sing
/ŋ/ – /f/	sink – silk
/l/ – /r/	lid – rid
/r/ – /w/	red – wed
/w/ – /j/	well – yell
/j/ – /tʃ/	you – chew
/tʃ/ – /dʒ/	chin – gin
/dʒ/ – /f/	large – laugh
/f/ – /v/	fat – vat
/v/ – /θ/	heave – heath
/θ/ – /ð/	wreath – wreathe
/ð/ – /s/	though – so
/s/ – /z/	bus – buzz
/z/ – /ʃ/	zoo – shoe
/ʃ/ – /ʒ/	Confucian–confusion
/ʒ/ – /t/	beige – bait

she, the lips are spread. If we now substitute one of these sounds for the other, we do not get a change of meaning – only a rather strange-sounding pronunciation. There is only one phoneme here – the voiceless palato-alveolar phoneme /ʃ/ (p. 157) – but it turns up in two different phonetic 'shapes', or variant forms, in these two words. These phonetic variants of a phoneme are known as *allophones*.

When we study a new language, it is important to pay careful attention to the phonetic variations which occur, to ensure that we make the right decisions about which sounds count as phonemes and which count as allophones. We do not know this information in advance; we have to work it out. And in doing so we have to be ready to cope with differences between the way sounds work in different languages. For example, English does not distinguish the meanings of words using a contrast between [ʃʷ] and [ʃ], but some other languages do (e.g. Luk). Sound differences that separate allophones in English may separate phonemes in another language, and vice versa – a principle that is clearly illustrated by the *l* sounds of such words as *leaf* and *pool*. The first *l* ('clear' *l*) is articulated much further forward in the mouth than the second ('dark' *l*) – as can be felt, if the sounds are said slowly to oneself. In English, these are allophones of a single /l/ phoneme. In Russian, however, they are different phonemes.

BEYOND THE SEGMENT

Several approaches to phonology have assumed that a language's sound system can best be analysed in terms of a series of individual segments ([b], [a], [s], etc.). But there are a number of phonological characteristics which affect units that are much larger than the individual segment, such as syllables, words, phrases, and sentences.

Several segments in a word or phrase may display the same phonetic feature – for example, they may all be lip-rounded or nasalized (p. 155). In particular, languages often display cases of *harmony* between consonants or vowels. In certain kinds of 'vowel harmony', for example, all the vowels within a word have to be of the same general type. Turkish is such a case, where words contain (with certain exceptions) only front vowels or back vowels. Thus we find [verdim] 'I gave' with front vowels, and [ʧodʒuk] 'child' with back vowels. But no words are formed with front + back combinations, such as [e] + [o] – a situation quite unlike English, where the sequence of vowels in a polysyllabic word is not predictable in this way.

The analysis of phonological features in terms of units larger than the segment is a preoccupation of several current theories, such as 'prosodic' phonology and 'autosegmental' phonology. Patterns of pitch, loudness, tempo, rhythm, and tone of voice provide another set of data which cannot be analysed with reference to single segments. These aspects of phonology are usually studied under a heading that well reflects this different emphasis: 'suprasegmental' phonology (§29). A specific approach that emphasizes the relationship between segments and syllabic sequences of rhythm and stress is known as 'metrical' phonology.

GROUPING SOUNDS INTO PHONEMES

In the phonemic approach to phonology, linguists faced with an array of sounds usually use three criteria in deciding whether these sounds belong to the same phoneme.

Complementary distribution The sounds must complement each other, in terms of where they occur in words. For example, in the case of the two /ʃ/ sounds in *shoe* and *she*, the rounded variety occurs only before rounded vowels, and the spread variety only before non-rounded vowels. Where we find the one, we do *not* find the other: they are mutually exclusive, never occurring in the same phonetic environment. Such sounds are said to be in 'complementary distribution'

Free variation If the sounds do occur in the same place in a word, then they can belong to the same phoneme only if they do not change the meaning of the word. For example, voiceless plosive sounds at the end of words are sometimes articulated in a relaxed way, and sometimes are pronounced quite strongly. The /p/ of *cup* might be heard with a tiny amount of audible breath ('aspiration') following its release, or a relatively large amount. But the different amounts of aspiration do not affect the meaning of the word: replacing weakly aspirated [pʰ] by strongly aspirated [pʰʰ] does not thereby change *cup* into some other word. Such sounds are said to be in 'free variation' – though whether the variation is in fact genuinely free, and not conditioned by such factors as social class or regional background, is an interesting question (p. 334).

Phonetic similarity To belong to the same phoneme, sounds ought to display a reasonable amount of physical similarity. The two kinds of /ʃ/ or the two kinds of /p/, in the above examples, satisfy this criterion, as the variants in each case have a great deal in common – the /ʃ/s are both voiceless palato-alveolar fricatives, and the /p/s are both voiceless bilabial plosives. However, it is sometimes possible to find sounds in complementary distribution that are *not* phonetically similar, and in these cases analysts would be reluctant to treat them as members of the same phoneme. A case in point is English [h] and [ŋ]: the former occurs at the beginning or in the middle of words; the latter only in the middle or at the end. They therefore rarely contrast. Could they, then, be taken as allophones of a single phoneme? No, because they have nothing phonetically in common, apart from both being consonants – [h] is a voiceless glottal fricative; [ŋ] is a voiced nasal continuant.

HOW MANY MINIMAL PAIRS *ARE* THERE?

A convenient way of displaying a language's phonemic substitutions is to construct a chart of possible words or syllables. Below is part of a chart adapted from Denyse Rockey's *Phonetic Lexicon* (1973, pp. 56–7). It shows some of the 117 monosyllables in English that end with /b/ (though this figure includes several obsolete, dialect, and technical words). The initial sounds of these words are listed vertically on the left, and the vowel sounds are listed horizontally across the top

Charts of this kind have all kinds of practical applications. They can help language teachers and speech therapists in pronunciation work. They can be a source of information to budding poets and Scrabble-masters (p. 64). Linguists can compare the use a language makes of individual combinations of phonemes and thus calculate the amount of work a phoneme has to do in a language. For example, English does not use final consonants with equal frequency, as can be seen from the following list, which is derived from Rockey's data. Each figure refers to the number of monosyllabic words ending with the consonant listed. It shows, for instance, that over twice as many monosyllables end in /k/ as end in /g/.

	i	ɪ	ɛ	æ	ɒ(+r)	ɑ/ɑ	ɔ(+r)
~	.	.	ebb	abb	.	ub	orb
p	.	.	.	.	.	.	.
b	.	bib	.	.	burb	bub	.
t	.	Tib	.	tab	.	.	.
d	dieb	dib	deb	dab	.	Dub	daub
k	.	.	keb	cab	.	cub	corbe
g	.	gib	.	gab	gurb	gob	goub
f	.	fib	.	.	.	fob	.
v	.	.	.	.	.	.	.
θ	.	.	.	.	.	.	.
ð	.	.	.	.	.	.	.
s	.	.	sib	.	sab	sob	sorb
z	.	.	.	.	.	.	.
ʃ	.	.	.	.	.	.	.
ʒ	.	.	.	.	.	.	.
h	.	.	.	.	.	hub	.
ʧ	.	.	.	.	.	.	.
ʤ	.	jib	.	jab	.	job	.

/-d/	429
/-z/	383
/-l/	376
/-n/	330
/-l/	313
/-k/	304
/-m/	240
/-p/	223
/-s/	212
/-ɪ/	153
/-g/	138
/-ʧ/	132
/-v/	122
/-b/	117
/-ʃ/	105
/-θ/	104
/-ŋ/	87
/-ʤ/	84
/-ʒ/	32

The English Consonants

		Labial	Dental / Alveolar		Palatal	Velar
Stops	[vl]	[p]	[t]		[č]	[k]
	[vd]	[b]	[d]		[j]	[g]
Fricatives	[vl]	[f]	[θ]	[s]	[š]	[h]
	[vd]	[v]	[ð]	[z]	[ž]	
Resonants (vd)	[nasal]	[m]	[n]			[ŋ]
	[semi-vowel]	[w]		[y]		
	[glide/liquid]		[l]	[r]		

The English Vowels

	FRONT Tense	FRONT Lax	CENTRAL	BACK Lax	BACK Tense
HIGH	[i] beet Hi Front Tense	Hi Front Lax bit [ɪ]	Bert [ɚ] Mid Central Retroflexed	Hi Back Lax foot [ʊ]	[u] boot Hi Back Tense
MID	bait [e] Mid Front Tense	Mid Front Lax bet [ɛ]	butt [ə] Mid Central	Mid Back Lax bought [ɔ]	boat [o] Mid Back Tense
LOW	Low Front bat [æ]			pot [a] Low Back	

English Consonant Phonemes

	Labial (incl Bilabial, Labiodental, and Labiovelar)	Dental (Interdental)	Alveolar (incl Alveolar, Lateral, and Retroflex)	Palatal (incl Affricate and Sibilant)	Velar (incl Pharyngeal and Labiovelar)
Stop Vl	p pat		t tack	tʃ chat	k cat
Stop Vd	b bat		d dad	dʒ Joe	g get
Fricative (incl Sibilant) Vl	f fat	θ thigh	s sit	ʃ shit	h hat
Fricative (incl Sibilant) Vd	v vat	ð thy	z zit	ʒ azure	
Nasal (Vd)	m dim		n din		ŋ ding
Semivowel (Vd)	w wing			j(y) you	(ʍ what)
Lateral Liquid (Vd)			l let		
Retroflex Liquid (Vd)			r ring		

- Vl Stops /p,t,tʃ,k/ are **aspirated** [p^h,t^h,$tʃ^h$,k^h] syllable-initially before stressed vowel: *spin* [spɪn] ~ *pin* [p^hɪn], *stop*[stap] ~ *top* [t^hap], *scoff* [skɔf] ~ *cough* [k^hɔf], etc.
- Palatal Affricates /tʃ,dʒ/ end in **sibilants** and pattern with others /s,ʃ,z,ʒ/ in final {-Z} suffixes: *churches* /tʃərtʃəz/, *judges* /dʒədʒəz/, *kisses* /kɪsəz/, *Bess's* /bɛsəz/, etc.
- Resonants (Nasals and Liquids) can be **syllabic** (i.e, function as vowels): *gargle* /gargəl/ [gargl̩], *happen* /hæpən/ [hæpn̩], *purple* /p^hərpəl/ [pɪrpl̩]
- All consonants are subject to **fast speech rules** of deletion, reduction, or merger: [dʒitʃɛt] *Did you eat yet?*, [k^jɛ̃ɯpjə] *Can I help you?*, [zɛ̃iθɛ̃ɯs] *Is there anything else?*

THE VOWELS

A good example of the speech–writing difference is the way we have to re-think the idea that 'there are five vowels' when we begin to discuss speech. There are in fact some 20 or so vowels in most accents of English (the exact number often depending on the way the system is analysed), and their sound qualities can vary enormously from accent to accent. The vowel sounds of American English, for example, are clearly different from those of British or Australian, and the vowels typical of one locality in any of these countries can differ appreciably from those of another. Indeed, vowel differences make up most of the distinctiveness which we associate with a particular accent (p. 298).

The table on this page shows the set of vowels found in English, along with some common transcriptions (for their place of articulation, see p. 240). The most striking feature of a list of this kind is the number of special symbols (part of the *phonemic transcription*) which have to be devised in order to identify each vowel unambiguously. With only five (or six) vowel letters available in the traditional alphabet, extra symbols, combinations of symbols, and diacritic marks are needed to capture all the units in the system, as well as all the variations in vowel quality which distinguish different accents (pp. 240–1).

TYPES OF VOWEL

• *Monophthongs* (or *pure vowels*) are vowels with a single perceived auditory quality, made by a movement of the tongue towards one position in the mouth. The first 12 vowel qualities in the above table are all monophthongs.

• *Diphthongs* are vowels where two vowel qualities can be perceived. The remaining eight vowel qualities in the table are all diphthongs. In */aɪ/*, for example, the sound begins with an open */a/*-type quality and ends with a close */i/*-type quality. It is important to note that here we are talking about phonetic diphthongs, not graphic ones: the sounds in *my*, *so*, and *how*, for example, are all diphthongs, even though each has only a single vowel letter.

• *Triphthongs* are vowels in which three vowel qualities can be perceived. The vowels in such words as *player* /pleɪə/, *fire* /faɪə/, *royal* /rɔɪəl/, *tower* /taʊə/, and *lower* /ləʊə/ can all be analysed in this way. No new symbols are required, however, as each can be seen as a combination of a diphthong + /ə/.

Often, in the history of English, a vowel has changed its quality. There are two chief possibilities. When a diphthong becomes a monophthong, the sound is said to be *monophthongized*; conversely, when a monophthong becomes a diphthong, the sound is *diphthongized*. An example of the former is the Southern US pronunciation of *my man*, which has become something more like *ma man* (i.e. *my* /maɪ/ has become /maː/). An example of the latter is the British mock-pronunciation of *yes* /jɛs/ as *yays* /jeɪs/. Indeed, an even more exaggerated form can sometimes be heard, /jeɪəs/, in which case we might say that the vowel has been *triphthongized*.

The vowels in	*Gimson*	*Jones*	*F&R*	*Variants*
sea, feet, me, field	iː	iː	i	
him, big, village, women	ɪ	i	ɪ	ɪ
get, fetch, head, Thames	e	e	ɛ	
sat, hand, ban, plait	æ	æ	æ	a
sun, son, blood, does	ʌ	ʌ	ʌ	
calm, are, father, car	ɑː	ɑː	ɑ	
dog, lock, swan, cough	ɒ	ɔ	ɑ	
all, saw, cord, more	ɔː	ɔː	ɔ	
put, wolf, good, look	ʊ	ʊ	ʊ	ʊ
soon, do, soup, shoe	uː	uː	u	
bird, her, turn, learn	ɜː	ɜː	ʌ (+ r)	ɜ· (+ r)
the, butter, sofa, about	ə	ə	ə	ə· (+ r)
ape, waist, they, say	eɪ	eɪ	e	
time, cry, die, high	aɪ	aɪ	ay	
boy, toy, noise, voice	ɔɪ	ɔɪ	oy	
so, road, toe, know	əʊ	oʊ	o	
out, how, house, found	aʊ, ɑʊ	aʊ	aw, æw	
deer, here, fierce, near	ɪə	iə	(i + r)	
care, air, bare, bear	eə	eə	(e + r)	
poor, sure, tour, lure	ʊə	uə	(u + r)	

TRANSCRIBING VOWELS

Several authors have devised sets of symbols for identifying English vowels. The system used in this book is the one introduced by British phonetician, A. C. Gimson in *An Introduction to the Pronunciation of English* (1st edn, 1962), which has been particularly influential in the field of teaching English as a foreign language.

• The Gimson system is given in the first column, after a selection of words which illustrate each sound. In several cases there is a wide range of spellings for the same vowel quality – a consequence of the mixed nature of English orthography (p. 274).

Two other vowel transcriptional systems are shown in the table.

• The system used by the British phonetician, Daniel Jones in his pioneering description of Received Pronunciation (p. 365). Gimson (a student of Jones) modified this system in an attempt to show vowel qualities more accurately. The Jones list does not include the use of */ɔə/*, which in Jones's day was a common pronunciation in such words as *four*, and distinct from the vowel of *bought*.

• The system used by Victoria Fromkin & Robert Rodman (F&R) in *An Introduction to Language* (1st edn, 1974), a widely used teaching textbook in the USA. It is a simplified version of the influential system devised by John S. Kenyon & Thomas A. Knott in *A Pronouncing Dictionary of American English* (1953), which aimed to provide a standard transcription for the vowels of the main dialects of American English.

• The final column in the table lists a few other symbols which are often seen representing certain vowels. Some are simply typographic variants; some represent a particular sound effect, such as the presence of *r* 'colouring' (p. 245); and */a/* is often used as a simpler alternative to */æ/*.

Possible confusibles

The transcriptions use the same symbols in different ways, partly because of different views about the best way to analyse the vowel system, and partly because of the differences between British and American English.

• */ɑ/* in the British systems does not appear as a separate phoneme. In F&R it is used in such words as *dog*, reflecting more directly the way this vowel is articulated further forward in the mouth. This is a major point of possible confusion for British-trained students casually reading an American transcription, for they risk interpreting */lag/* as *lag* instead of *log*. In addition, the same */ɑ/* symbol is used by F&R in such words as *father*, *calm*, and *car*, again reflecting the typical sounds of these vowels in American English, whereas the British systems use */ɑː/* – an important difference between the two sound systems.

• */e/* in F&R refers to the vowel in such words as *say*, whereas the British systems show the diphthongal nature of this sound (p. 239) as */eɪ/* or */ei/*. Thus, */mel/* refers to *mel* in Gimson, but to *mate* in F&R.

• */ʌ/* in the British systems refers only to the vowel in such words as *sun*. In F&R it is also used for the vowel in such words as *bird* (along with a following */r/* consonant).

• */o/* in F&R refers to the vowel in such words as *so*. British students used to a diphthongal transcription would therefore be likely to interpret */koʊl/* as *cot* rather than *coat*.

• F&R do not have separate symbols for the sounds in such words as *deer*, *care*, and *poor*. These words are analysed as combinations of vowel + */r/*, and their different status shown in the table by the use of parentheses.

5D

DISTINCTIVE FEATURES

In a phonemic analysis, it is necessary to recognize smaller units than the segment, in order to explain how sets of sounds are related. This can be seen by comparing any two contrasting segments, using the articulatory criteria introduced in §27.

- English /p/ and /b/ differ in one respect only: /p/ is voiceless, and /b/ is voiced. In other respects, they are the same: they are both bilabial, plosive, oral, and pulmonic egressive.
- /p/ and /g/ differ in two respects: there is a contrast of voicing, and there is also a contrast in the place of articulation – bilabial vs velar.
- /p/ and /z/ differ in three respects: this time, there is a contrast in the manner of articulation (plosive vs fricative), alongside the contrasts in voicing and place.

All segments in a language can be analysed in this way, either from an articulatory or an acoustic (p. 146) point of view, and the result is a set of contrasting components known as *distinctive features*. The English segment /p/, for example, is a combination of the features of 'voicelessness', 'plosiveness', and 'bilabiality'. In early versions of distinctive feature theory, these features are given two values, symbolized by the signs + and –, as in [±voice], [±nasal]. For example, [n] is both [+nasal] and [+voice]; [p] is [–nasal] and [–voice]. A small set of these contrasts is worked out and applied to all the sounds that turn up in a language. Results may be presented in the form of a matrix, in which the presence or absence of each feature is noted (see below).

In phonological theory since the 1980s, features have become a focus of attention in their own right, and are widely viewed as the basic unit of phonological representation. The merits of *unary* (single-valued) as opposed to *binary* analyses have been presented by some models. In addition to questions of feature identification and definition, however, recent research has focused on the way features are organized within phonological representations, as part of non-linear phonology. In particular, *feature geometry* looks especially at the non-linear relationship between features, and at the way they can be grouped into a hierarchical array of functional classes.

Distinctive feature theory has been primarily used by *generative* approaches to linguistics (§65), where the aim is to provide an account of phonology that can be integrated within a theory of grammar (§16). It is argued that distinctive features are the important facts to take into account when carrying out a phonological analysis, as they reveal more about the way in which the sounds of a language are organized, and more readily permit generalized statements within and between languages, than do descriptions based on phonemes and allophones. A particular advantage is that the same set of terms can be used for describing both vowels and consonants – something traditional articulatory descriptions were unable to do (as can be seen from the diverse, 'two-mouth' terminology of §27).

English consonant matrix

	p	b	f	v	m	t	d	θ	ð	s	z	n	ʧ	ʤ	ʃ	ʒ	k	g	l	r	w	j	h	ŋ
consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	–	–	–	+
vocalic	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	+	–	–	–	–
diffuse	+	+	+	+	+	+	+	+	+	+	+	+	–	–	–	–	–	–	–	+	–	–	–	–
compact	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
grave	+	+	+	+	+	–	–	–	–	–	–	–	–	–	–	–	+	+	–	–	+	–	+	+
flat	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–
voice	–	+	–	+	+	–	+	–	+	–	+	+	–	+	–	+	–	+	+	+	+	+	–	+
continuant	–	–	+	+	–	–	–	+	+	+	+	–	–	–	+	+	–	–	+	+	+	+	+	–
strident	–	–	+	+	–	–	–	–	–	+	+	–	+	+	+	+	–	–	–	–	–	–	–	–
nasal	–	–	–	–	+	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	+

Matrix for a seven-vowel system

	i	e	a	u	o	ɔ	ɑ
consonantal	–	–	–	–	–	–	–
vocalic	+	+	+	+	+	+	+
diffuse	+	–	–	+	–	–	–
compact	–	–	+	–	–	+	+
grave	–	–	–	+	+	+	+
flat	–	–	–	+	+	+	–
voice	+	+	+	+	+	+	+
continuant	+	+	+	+	+	+	+
strident	–	–	–	–	–	–	–
nasal	–	–	–	–	–	–	–

DISTINCTIVE-FEATURE MATRICES

The features are listed on the left of each matrix, and the segments are listed along the top. Each segment is analysed in terms of all features. The terminology used in these particular matrices relates to the traditional articulatory terms used in §27 in the following way (V = vowel, C = consonant):

+ compact	low V
– compact	high and mid V
+ consonantal	obstruction in vocal tract
– consonantal	no vocal tract obstruction
+ continuant	fricative / approximant C
– continuant	stop / affricate C
+ diffuse	high V; labial / dental / alveolar C
– diffuse	low V; palatal / velar / back C
+ flat	rounded V
– flat	unrounded V
+ grave	back V; labial / velar back C
– grave	front V; dental / alveolar / palatal C
+ nasal	nasal C
– nasal	oral C
+ strident	fricative / affricate C with high-frequency noise
– strident	C with low-frequency noise
+ vocalic	glottal vibration with free passage of air through vocal tract
– vocalic	no glottal vibration or free passage of air
+ voice	voiced C
– voice	voiceless C

(After R. Jakobson & M. Halle, 1956.)

PHONOLOGICAL RULES

In traditional accounts of phonology, a sound is described as occurring in a particular position within a syllable or word, and that is all. No reference is made to our knowledge of the relationships that exist between the various types of sound in different contexts. Yet this information is essential if we are to understand the way sounds systematically relate to each other and to the grammar and lexicon of a language.

To illustrate this point, we may consider such pairs of words as *telegraph* and *telegraphy*. A phonological analysis of these words is not complete simply by giving each a phonemic transcription: /teləgrɑ:f/ vs /tɪlegrəfɪ/. We also need to show that, despite the different patterns of strong and weak vowels within them, the pronunciations are systematically related, with other pairs of words in the language displaying the same kind of relationship (such as *microscope / microscopy*). In recent years, relationships of this kind have become a major focus of phonological investigation. And one of the main techniques for demonstrating such regularities in the sound patterns of language has been through the use of *phonological rules*.

Phonological rules are general statements about the relationships between sounds, or classes of sound. They summarize what happens when sounds occur in particular grammatical or phonetic contexts. In English, for example, [b] is used at the beginning and at the end of words, but especially in the latter position it loses some of its voicing: we say [dʒaḇ] (*jab*), with a 'devoiced' sound. This observation can be summarized in the form of a rule: '[b] becomes [ḇ] at the end of a word.' The validity of the rule can then be tested against other examples, to see if there are exceptions.

Phonological rules are expressed in a special notation to make the description as clear and succinct as possible and (according to some analysts) to identify the essential theoretical properties of sound systems. The above rule could be written as follows (the symbol '→' means 'becomes'; '/' means 'in the context of'; and '#' means 'word boundary'):

$$[b] \rightarrow [ḇ] \; / \; - \#$$

In generative phonology, such rules would be written using a distinctive feature notation:

$$\begin{bmatrix} +\text{consonantal} \\ -\text{nasal} \\ +\text{voice} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{consonantal} \\ -\text{nasal} \\ -\text{voice} \end{bmatrix} \; / \; - \#$$

(or, 'voiced oral consonants become voiceless oral consonants before a word boundary'). Several such notational conventions have been devised in order to cope with all the types of phonetic relationship that have been observed.

There are many kinds of phonological rule. Some rules, such as the above, change the distinctive features of segments. A further example, from the domain of connected speech, would be the change of [n] to [m] in the phrase *ten boys*, because of the influence of the following [b]. Here, the rule would summarize the fact that 'an alveolar nasal becomes bilabial before a following bilabial consonant'.

Other rules add or delete segments. An addition rule accounts for the way in which some English accents add vowels between certain consonant segments, as in the pronunciation of *film* as [fɪləm]. A deletion rule occurs when vowel segments are regularly omitted from such phrases as *I am* (→ *I'm*) in certain grammatical contexts. There are also rules that combine two segments as one, as when *would* + *you* become [wʊdʒu:] (p. 166).

Phonological rules are not restricted to making statements about the sound patterns of a particular language. They are also used to demonstrate the similarities and differences between the sound systems of different languages. Is the rule about consonant devoicing at the ends of words found only in English, or does it apply to a larger group of languages, or possibly to all languages? The formulation of phonological rules is thus seen as an important step towards the phonologist's goal of discovering the universal principles governing the use of sound in language.

ABSTRACT OR CONCRETE?

In order to arrive at satisfactory generalizations, phonologists have often introduced abstract underlying forms into their rules from which several pronunciations can be derived. For example, the words *impossible*, *indecisive*, and *inconclusive* all begin with the same prefix, meaning 'not', but the pronunciations differ. In the first case, it is [ɪm] (because of the following bilabial); in the second case it is [ɪn] (before the alveolar consonant); and in the third case, for many speakers, it is [ɪŋ] (before the velar consonant). How can this variation be explained?

It is not very convincing to suggest that one form is more important than the others, and set up a rule in which two of these forms are derived from the third. It is more plausible to say that all three are 'equal', and to derive them from a single 'underlying form'. One such representation would be [ɪN], where 'N' stands for a nasal feature.

This solution seems reasonable, as 'N' is clearly related to the three pronunciations, each of which is nasal. But what happens if we extend the example to include such forms as *irregular* and *illiberal*? Again, the prefix means 'not'; and the differences seem to result from the following sounds. Should we therefore group [l] and [r] along with [m], [n], and [ŋ], and have a single rule for all five possibilities?

If we do, we must set up an underlying form from which all can plausibly be derived. [ɪN] no longer seems appropriate, as two of the sounds are not nasal. [ɪC] (where 'C' stands for 'consonant') would be too general, as not all consonants are used as part of the set of negative prefixes. Some intermediate category needs to be devised, which is sufficiently abstract to enable all the sounds to be grouped together, yet sufficiently concrete (that is, phonetically real) to provide a meaningful explanation about what is taking place. It would be possible to invent a category [X] (where 'X' = [m, n, ŋ, l, r]), but this seems an arbitrary solution, which lacks clear phonetic motivation. Moreover, it is not immediately obvious how this category would be useful in describing other areas of the language.

Problems of this kind have attracted a great deal of discussion in phonological theory in recent years. There is much disagreement about the extent to which phonological analyses of this kind do or should express psychological reality – that is, represent the native speaker's intuitions about the way the sound system works (p. 413). And the degree of abstractness that should be allowed into an analysis is especially controversial. Some approaches permit the use of symbols in the underlying representations that have no phonetic reality at all. Other (so-called 'natural') approaches require that all symbols introduced into an analysis bear a clear relationship to the physically real processes of articulation.

SYLLABLES

The syllable is of considerable relevance to the task of phonetic and phonological description. It is a notion that people intuitively recognize ('Shall I put it in words of one syllable?') and there are several writing systems in which each syllable is represented by a symbol (p. 203). But it is by no means easy to define what syllables are or to identify them consistently. Do such words as *fire*, *meal*, and *schism* have one syllable or two? Do *meteor* and *neonate* have two syllables or three?

A syllable is a unit that is larger than a single segment and smaller than a word. However, this characterization can be seen from both a phonetic and a phonological point of view. In phonetics, some have attempted to identify syllables on the basis of the amount of articulatory effort needed to produce them. The psychologist R. H. Stetson (1892–1950) was one who argued that each syllable corresponds to an increase in air pressure, air from the lungs being released as a series of chest pulses – the *pulse* or *motor* theory of syllable production. These pulses can often be readily felt and measured, especially when people speak emphatically. The main objection to the theory is that the pulses are sometimes very difficult to detect – for example, in adjacent syllables when two vowels co-occur (as in the word *doing*, which is two syllables, but usually spoken with a single muscular effort).

The linguist Otto Jespersen (1860–1943) presented an alternative phonetic approach, known as the *prominence* theory. This defines the syllable in auditory terms, arguing that some sounds (vowels) are intrinsically more sonorous than others (p. 134), and that each peak of sonority corresponds to the centre of a syllable. The problem with this view is that other factors than sonority enter into the definition of prominence (such as the pitch level of a sound), making the notion difficult to define objectively. Also, prominence theory does not always give a clear indication of where the boundary between syllables falls. In such words as *master*, should the syllable division be *ma-ster*, *mas-ter*, or *mast-er*? We are left with this problem, even though in each case the relative sonority of the sounds is the same.

A phonological approach

Phonological views of the syllable focus on the way sounds combine in a language to produce typical sequences. Two classes of sound are established: sounds that can occur on their own, or are at the centre of a sequence of sounds (*vowels* (V)); and those that cannot occur on their own, or are at the edge of a sequence (*consonants* (C)) (p. 154). Typical sequences include CV *tea*, CVC *hat*, CCVC *stop*, etc. In this way the range of syllable types used in a language can be identified and different languages compared. For example, some languages use only V or CV syllables (e.g. Hawaiian); others use several consonants before and after the vowel (e.g. English can have as many as three before and four after – CCCVCCCC, as in some pronunciations of *strengths*).

The syllable, in this view, takes its place as an important abstract unit in explaining the way vowels and consonants are organized within a sound system. There is, moreover, empirical evidence for the psychological reality of syllables, from the study of speech errors and related phenomena. In 'slips of the tongue', for example, the kinds of substitutions generally display the influence of syllabic structure: initial consonants tend to replace each other, as do final consonants. Thus one study reports many reversals of the types 'feak and weeble' (for *weak and feeble*) or 'tof shelp' (for *top shelf*), but there are few reversals that mix up places in syllable structure (p. 264).

POSSIBLE SYLLABLES

The number of possible syllables (i.e. combinations of different consonants and vowels) varies greatly from language to language. Totals from the UPSID survey (p. 167) include:

Hawaiian	162
Rotokas	350
Yoruba	582
Tsou	968
Gã	2,331
Cantonese	3,456
Quechua	4,068
Vietnamese	14,430
Thai	23,638

JUNCTURE

Phonetic boundaries used to demarcate words or other grammatical units are known as *junctures*. There are several phrases in English that are distinguishable in this way

that stuff	vs that's tough
an aim	a name
I scream	ice cream
nitrate	night rate

In the first case, for example, the [s] of *stuff* is stronger; and the [t] of *tough* is aspirated. It is not always easy to hear the differences when the phrases are said side-by-side; but the acoustic changes can be readily observed in a spectrogram (p. 136).

CONNECTED SPEECH

When words combine into connected speech, several things can happen to the pronunciation of their individual segments. The speed and rhythm can cause some segments to adopt a weaker articulation, some to drop out, some to be put in, and some to change character altogether.

Strong and weak

Words sometimes have both strong ('accented') and weak ('unaccented') forms, depending on whether they are pronounced with force. Words that express grammatical relationships in a language are particularly affected. In the following selection from English, the pronunciations on the left are heard when the words are said in isolation, or with emphasis; on the right, when they are said in normal conversation.

a	/eɪ/	/ə/
and	/and/	/ənd, n̩/
could	/kʊd/	/kəd, kd/
had	/had/	/əd, d/
him	/hɪm/	/ɪm/
is	/ɪz/	/s, z/
not	/nɒt/	/nt, n̩/

Elision

In rapid speech, sounds may be left out, or *elided*, especially when they occur as part of a cluster of consonants. In English, alveolar consonants are commonly lost, especially at the ends of words, e.g. the final alveolar plosive would normally be dropped in such phrases as *next day*, *mashed potatoes*, *stopped speaking*, or *got to go* (= 'gotta go'). The initial weak vowel may elide in such phrases as *go away* and *try again*.

Liaison

A sound may be introduced between words. Liaison is a notable feature of French, e.g. the final *t* of *c'est* is pronounced when followed by a vowel. It can also be illustrated from English Received Pronunciation (p. 39). In this accent, the final *r* is not sounded in such words as *four* and *father*, when they are pronounced in isolation, or at the end of a sentence; but when followed by words that begin with a vowel, a 'linking *r*' is regularly used, as in *four o'clock* or *father and mother*.

Assimilation

In connected speech, adjacent sounds frequently influence each other so that they become more alike, or *assimilate*. There are three main kinds of assimilation:

regressive (or *anticipatory*), in which a sound is influenced by a *following* sound, e.g. *ten bikes* being pronounced as /tem baɪks/.

progressive, in which a sound is influenced by a preceding sound, e.g. *lunch score* becomes /lʌnʃ ʃkɔː/.

coalescent (or *reciprocal*), in which there is mutual influence or 'fusion', e.g. *don't you* becomes /dəʊnʧʊ/.

These effects partly illustrate the role of phonetic coarticulation (p. 158), but they are also partly phonological in character, as the rules differ from language to language.

COMPARATIVE PHONOLOGY

Given that the human vocal tract is capable of articulating such a wide range of sounds (§27), several questions naturally arise. Which sounds turn up most frequently in the languages of the world? Are there any sounds that occur in all languages? What patterns of sound can be found in different languages, and are there any similarities between the patterns that occur?

Questions about language universals and tendencies (§14) cannot be answered in an impressionistic way, nor even by comparing the language studies of several authors, whose methodology is likely to differ. Answers require a systematic survey of a representative sample of languages, in which the same analytic methods are used in each case, and which is sufficiently large to enable some statistical conclusions to be drawn. The findings presented in the following pages are based on an American survey known as UPSID (The *U*niversity of California, Los Angeles *P*honological *S*egment *I*nventory *D*atabase). The inventories of 317 languages were included, with one language being selected from each family grouping recognized (e.g. one from West Germanic, one from East Germanic, and so on (§50)). The segments were analysed as phonemes (p. 162), each unit being represented by its most characteristic variant. (After I. Maddieson, 1984.)

Number of segments

It is not yet known whether there is an upper limit on the number of segments that can be efficiently distinguished in speech, or a lower limit set by the smallest number of segments needed to build up a vocabulary. The smallest inventories in the UPSID sample contained only 11 segments: Rotokas (Indo-Pacific) and Mura (Chibchan). Several Polynesian languages are known to have very small inventories. By contrast, the largest inventory belonged to !Xũ (Khoisan), with 141 segments, with several other languages of this family displaying comparably large totals. Between these extremes, 70% of the languages in the sample had between 20 and 37 segments.

When the inventories are analysed into types of sound, consonants emerge as being far more common than vowels. The number of consonants (C) in an inventory varies between 6 and 95 (a mean of 22.8); the number of vowels (V) varies between 3 and 46 (a mean of 8.7). If we divide V by C, the resulting ratio varies between 0.065 and 1.308. It is possible to say that the 'typical' language has over twice as many Cs as Vs. Larger inventories tend to have a higher proportion of Cs. However, several languages do not conform to these trends, such as Haida (Amerindian), with 46C but only 3V, and Pawaian (Indo-Pacific), which actually has more V (12) than C (10).

Dependencies

Several important dependencies can be observed between the sounds that are used in languages. These take the form of 'implicational' statements, of the type: 'If X occurs, then Y will occur.' For example, there are only four exceptions in the UPSID sample to the statement that if a language contains /p/, it will also contain /k/. There is only one exception (Hawaiian) to the statement that if /k/ occurs, then /t/ will occur (though /t/ can in fact be heard in some Hawaiian varieties). Similarly, if there is /g/, there will be /d/; if /d/, then /b/; and if /m/, then /n/.

More generally, nasals do not occur unless stops occur at the same place of articulation (five exceptions); voiceless nasals and aproximants (p. 159) do not occur unless the language has their voiced counterparts; and mid-vowels do not occur unless there are high and low vowels (two exceptions).

Areal statements

The UPSID survey selects single languages from the main language families. There is also a need for detailed phonological studies of all the languages spoken within a geographical area, to determine the nature of any preferences for certain types of sound. Such *areal* studies (p. 33) would draw attention to such features as the prevalence of click consonants in South Africa (and also in certain East African languages), pharyngeals and glottals in Afro-Asiatic languages, retroflex consonants in South Asia, or implosives and labio-velar coarticulation (p. 158) in African languages. Historical evidence is sometimes available to explain the development of an areal phonological feature, but all too often the reasons are lost.

FAVOURITE CONSONANTS

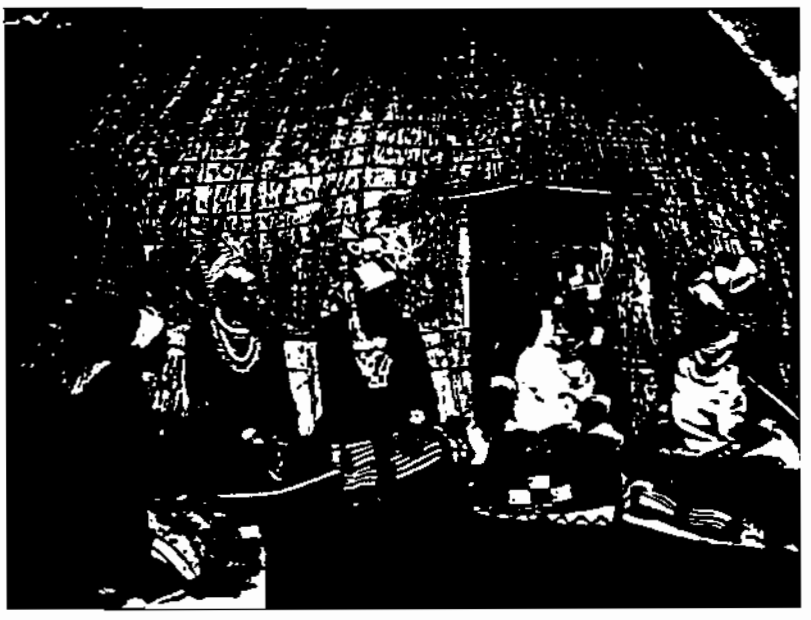
What would a language look like, if it included only the most common consonant segments? The 20 most frequent consonants were extracted from the UPSID file, to display the following system (alveolar and dental phones are grouped together):

p, b	t, d	ʧ	k, g	ʔ	
f	s	ʃ			
m	n	ɲ	ŋ		
w	l, r	j		h	

Most languages have between 14 and 16 of these segments. No language has exactly this system, but some are very close to it, e.g. Bambara (Niger-Congo), which lacks [ʔ], and includes [z] and [ʤ].

The UPSID survey shows the typical range of consonant segments to be between five and 11 stops, one and four fricatives, two and four nasals, and four others. No one segment is found in all languages. (After I. Maddieson, 1984.)

Why did the click sounds spread from the Khoisan languages into other parts of South and East Africa? One theory is that Zulu and Xhosa women borrowed the clicks so as to disguise words that would be taboo in their own languages.



A group of brides in a Zulu village.

STOPS

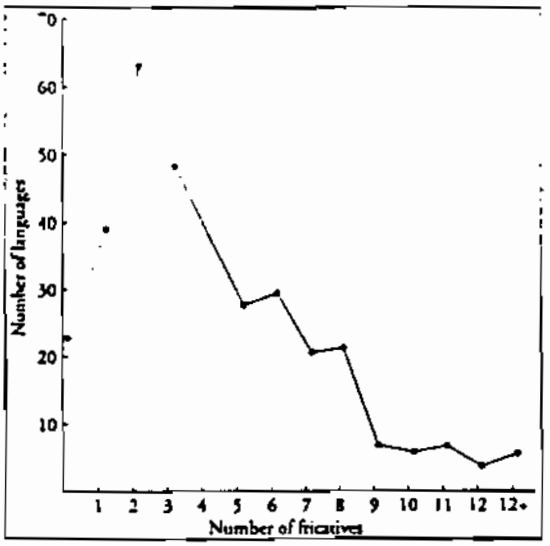
All languages in the UPSID survey have stop consonants (p. 159), with voiceless segments occurring much more commonly than voiced (92% vs 67%). Other types of stop are much less common, such as aspirated (29%), voiceless ejectives (16%), and voiced implosives (11%). Most languages have two types of stop, but the number varies between one and six. Languages with very complex sets of stops include Igbo (Niger-Congo) and !Xū (Khoisan), each with six types. The Igbo inventory, for example, is as follows:

5 voiceless unaspirated plosives	5 voiceless aspirated plosives
5 voiced plosives	5 breathy voiced plosives
2 voiceless implosives	1 voiced implosive

Similarly, most languages have stops at three or four places of articulation (excluding glottal stops). Over 99% have bilabial, dental/alveolar, and velar stops. A few have only two places of articulation (e.g. Hawaiian). Some (mainly Australian languages) have as many as six, with stops in bilabial, dental, alveolar, retroflex, palatal, and velar positions.

FRICATIVES

At least one fricative (excluding /h/) is found in 93% of the UPSID languages; most of the cases where fricatives are absent are Australian. As can be seen from the following graph, the majority of languages have up to four fricatives, but some have 12 or more.



The most frequent fricative is a dental/alveolar sibilant: 83% of the languages have some form of /s/. Next comes /ʃ/ and /f/, then /z/, /x/, /v/, and /ʒ/, in that order. The asymmetry between /s/ and /z/ is worth noting: the latter is found in only a third as many languages. /h/, when analysed as a fricative (as opposed to a kind of breathy vowel), is found in 63% of the languages.

The largest set of fricatives is found in Kabardian (Caucasian), where there are 22 in all, grouped into eight types:

7 voiceless non-sibilant	7 voiced non-sibilant
2 voiceless sibilant	2 voiced sibilant
1 voiceless non-sibilant ejective	1 voiceless sibilant ejective
1 voiceless lateral	1 voiced lateral

NASALS

Almost all UPSID languages (97%) have at least one phoneme whose main allophone is a voiced nasal, and this is usually /n/ (in 96% of cases). If there is a second nasal, it will usually be /m/. Languages with two, three, or four nasals are common; the maximum seems to be six. Only four languages in the whole sample have no nasal segments at all (such as Rotokas (Indo-Pacific)).

The majority of nasal consonants are voiced: 93%. Fewer than 4% are voiceless. The most common nasal segments are dental/alveolar, followed by bilabial, velar, and palatal.

LIQUIDS AND APPROXIMANTS

The UPSID analysis distinguishes between 'liquid' sounds (/l/ and /r/) and 'approximant' sounds (/j/ and /w/) (p. 158). Most languages (96%) have at least one liquid; 72% have more than one. /l/ segments are somewhat more common than /r/ segments. Irish Gaelic has the largest number of liquids: 10 (2 voiced flaps, 2 voiceless flaps, 4 voiced laterals, and 2 voiceless laterals). At the other extreme, several languages have none, such as Nootka (Amerindian). The majority of liquids are voiced (83%); 87% of them are dental/alveolar. The most common /r/ segments are also voiced (97%), and involve rapid tongue-tip movements (trills, taps, and flaps – 86%). Uvular [ʀ], found in French and German, is not a common segment.

The approximants are also widely used. A /j/ segment is found in 86% of the languages; a /w/ segment in 76%.

GLOTTALICS

Ejectives are the most common consonant to use a glottalic air stream (pp. 126–7). They are typically voiceless (99%) and are commonly stops (60%). Two-thirds of all ejectives are found in Amerindian languages, especially from North America. In 100% of cases, if a language has a single ejective, it is /k'/. Some languages have as many as five ejective consonants, e.g. bilabial, dental/alveolar, palatal, velar, and uvular.

The majority of implosives are found in African languages. These are typically voiced (97%). If a language has a single implosive, it is usually /ɓ/. Some languages have as many as four such segments: bilabial, dental/alveolar, palatal, and velar or uvular.

SEGMENT FREQUENCY WITHIN A LANGUAGE

In southern British English, an analysis of the frequency of vowels and consonants in conversation produced the following totals (after D. B. Fry, 1947).

Consonants	%	*Vowels*	%
n	7.58	ə	10.74
t	6.42	ɪ	8.33
d	5.14	e	2.97
s	4.81	aɪ	1.83
l	3.66	ʌ	1.75
ð	3.56	eɪ	1.71
r	3.51	iː	1.65
m	3.22	əʊ	1.51
k	3.09	a	1.45
w	2.81	o	1.37
z	2.46	ɔː	1.24
v	2.00	uː	1.13
b	1.97	u	0.86
f	1.79	ɑː	0.79
p	1.78	aʊ	0.61
h	1.46	ɜː	0.52
ŋ	1.15	ɛə	0.34
g	1.05	ɪə	0.21
ʃ	0.96	ɔɪ	0.14
j	0.88	ʊə	0.06
ʧ	0.60		
ʤ	0.41		
θ	0.37		
ʒ	0.10		

VOWELS

The 2,549 vowel segments in the UPSID data can be classified on the basis of place and manner of articulation as follows:

Italic figures indicate unrounded vowels. Bold figures indicate rounded vowels.

	front	central	back
high	*452* **29**	*55* **10**	*31* **417**
mid	*425* **32**	*100* **8**	*19* **448**
low	*81* **0**	*392* **1**	*13* **36**

It can be seen that front vowels are usually unrounded (94%), and back vowels are usually rounded (93.5%). Low vowels are usually central (75%), and central vowels are usually low (69%). High front vowels are much more common than high back vowels.

The smallest vowel systems turn out to have three members (fewer than 6% of UPSID languages). Some languages have been analysed as having fewer than this (such as Kabardian (Caucasian)), but the analysis depends on how much of the phonetic contrasts observed can be attributed to the consonant system. There seem to be no clear cases of 1-vowel languages. By contrast, the largest number of vowel segments is 24 (!Xũ (Khoisan)). Most languages have between 5 and 7 vowels – a point that can cause some surprise to speakers of Indo-European languages, which have many more. German and Norwegian both have 15 vowel-quality contrasts (disregarding length) – the largest totals in the survey.

The more vowel qualities there are in a language, the more likely that language is to show length contrasts – though in fact only 20% of the languages have both long and short vowel segments. Similarly, only 22% of the languages contrast oral and nasal vowels.

There are only 83 clear cases of diphthongal phonemes in the whole UPSID sample, found in only 23 languages. Over a quarter of these occur in just one language, !Xũ, which has four series of diphthongs: oral, nasalized, pharyngealized oral, and pharyngealized nasal.

VOWEL SYSTEMS

Phonologists usually describe vowel systems with reference to the articulatory space they occupy, as represented by such models as the Cardinal Vowel diagram (p. 156). About 86% of the languages in the UPSID survey have their vowels evenly and widely distributed within this space (the principle of 'vowel dispersion'), and it thus becomes possible to talk about vowel arrangements using an analogy with basic geometrical shapes. Most vowel systems are 'triangular' in shape, especially based on a 3- or 5- vowel pattern. Fewer than 10% of the languages have 'square' or 'rectangular' systems. (Diphthongs are not taken into account in the systems illustrated right.)

3-vowel systems

Aranda (Australian)
Greenlandic (Eskimo-Aleut)

Amuesha (Andean-Equatorial)

4-vowel systems

Rukai (Austronesian)

Klamath (Penutian)

5-vowel systems

Spanish (Indo-European)

Japanese (Isolate)

Hebrew (Afro-Asiatic)

Tsakhur (Sino-Tiberan)

6-vowel systems

Lappish (Uralic)

Kunakuru (Afro-Asiatic)

Malay (Austronesian)

Chamorro (Austronesian)

7-vowel systems

Kutcha (Niger-Congo)

Kunama (Nilo-Saharan)

8-vowel systems

Osmanli (Ural-Altaic)

Javanese (Austronesian)

9-vowel system

Masai (Nilo-Saharan)

12-vowel system

English (Indo-European)

14-vowel systems

Bambara (Niger-Congo)

Wolof (Niger-Congo)

20-vowel system

Panjabi (Indo-European)

FROM ONE EXTREME TO THE OTHER

The remarkable differences between the phonological systems of the world's languages is nowhere better illustrated than by a comparison of the smallest and largest consonant inventories in the UPSID survey (some phonetic symbols have been changed in the 1989 IPA revision, p. 161).

ROTOKAS (Indo-Pacific)

Consonants	*Bilabial*	*Alveolar*	*Velar*
Voiceless plosive	p	t	k
Voiced plosive			g
Voiced non-sibilant fricative	β		
Voiced tap		D	

!XŨ (Khoisan)

Consonants *Non-clicks* (47)	*Bilabial*	*Alveolar*	*Alveolar velarized*	*Palato-alveolar*	*Palato-alveolar velarized*	*Palatal*	*Velar*	*Velar pharyngealized*	*Variable place*	*Labial-velar*
Voiceless plosive	p	t	ᵗ				kˣ			
Voiceless aspirated plosive	pʰ	tʰ					kʰˣ			
Voiced plosive	b	d	d				g			
Breathy voiced plosive							gʱ			
Voiceless ejective stop		tʼ					kʼˣ			
Voiced ejective stop	bʼ	dʼ					gʼ			
Voiceless sibilant affricate		ʦ	ʦˠ	ʧ	ʧˠ					
Voiceless aspirated sibilant affricate		tsʰ		ʧʰ						
Voiced sibilant affricate			ʣˠ		ʤˠ					
Voiceless sibilant ejective affricate		ʦʼ		ʧʼ						
Breathy voiced sibilant affricate		ʣ̈		ʤ̈						
Voiced sibilant ejective affricate		dzʼ		ʤʼ						
Voiceless non-sibilant fricative							x			
Voiced non-sibilant fricative									ɦ	
Voiceless sibilant fricative		s		ʃ						
Voiced sibilant fricative		z		ʒ						
Voiced nasal	m	n					ŋ	ŋˤ		
Long voiced nasal	mː									
Breathy voiced nasal	m̤									
Laryngealized voiced nasal	m̰									
Voiced flap		ɾ								
Voiced central approximant						j				w

Clicks (48)	*Dental*	*Dental nasalized*	*Dental nasalized and velarized*	*Dental velarized*	*Alveolar*	*Alveolar nasalized*	*Alveolar nasalized and velarized*	*Alveolar velarized*	*Palatal*	*Palatal nasalized*	*Palatal nasalized and velarized*	*Palatal velarized*
Voiceless					ǃ			ǃˠ	ǂ			ǂˠ
Voiceless aspirated					ǃʰ	ǃᵑʰ			ǂʰ	ǂᵑʰ		
Glottalized voiceless						ǃᵑˀ	ǃᵑˀ				ǂᵑˀ	
Voiced					ǃ	ǃᵑ		ǃᵍ	ǂ	ǂᵑ		ǂᵍ
Breathy voiced					ǃʱ	ǃᵑʱ			ǂʱ	ǂᵑʱ		
Glottalized voiced								ǃᵍˀ				ǂᵍˀ
Voiceless affricated	ǀˣ			ǀˣ								
Voiceless aspirated affricated	ǀʰˣ	ǀᵑʰˣ										
Glottalized voiceless affricated		ǀᵑˀˣ	ǀᵑˀˣ									
Voiced affricated	ǀᵍˣ	ǀᵑᵍˣ		ǀᵍˣ								
Breathy voiced affricated	ǀᵍʱˣ	ǀᵑᵍʱˣ										
Glottalized voiced affricated				ǀᵍˀˣ								
Voiceless lateral affricated									ǂˡˣ			ǂˡˣ
Voiceless aspirated lateral affricated									ǂˡʰˣ	ǂᵑˡʰˣ		
Glottalized voiceless lateral affricated											ǂᵑˡˀˣ	
Voiced lateral affricated									ǂˡᵍˣ	ǂᵑˡᵍˣ		ǂˡᵍˣ
Glottalized voiced lateral affricated												ǂˡᵍˀˣ
Breathy voiced lateral affricated									ǂˡᵍʱˣ	ǂᵑˡᵍʱˣ		

Some English Allophonic Variations

1. [p~pʰ t~tʰ k~kʰ]

[pʰɪl] ..... 'pill'	[spɪl] ..... 'spill'	[slɪp]~[slɪpʰ] ..... 'slip'
[kʰar] ..... 'car'	[skar] ..... 'scar'	[rak]~[rakʰ] ..... 'rock'
[tʰay] ..... 'tie'	[stay] ..... 'sty'	[sæt]~[sætʰ] ..... 'sat'
[əpʰíl] ..... 'appeal'	[fɪks] ..... 'fix'	[dɪtʰǽtš] ..... 'detach'
[wɔ́kɪŋ] .. 'walking'	[sɨptʰémbər] .... 'September'	[séptm̩] ..... 'septum'

2. [r~r̥ l~l̥ w~w̥ y~y̥]

[kʰr̥ayd] ..... 'cried'	[rayd] ..... 'ride'	[strim] ..... 'stream'
[pʰl̥id] ..... 'plead'	[lid] ..... 'lead'	[splæš] ..... 'splash'
[tʰw̥əys] ..... 'twice'	[wəyt] ..... 'white'	[skwərm] ..... 'squirm'
[kʰy̥ut] ..... 'cute'	[yu] ..... 'you'	[skyu] ..... 'skew'
[rɨkʰw̥ést] ..... 'request'	[rékwɨzɨt] ..... 'requisite'	
[rìpʰr̥ínt] ..... 'reprint' (V)	[rípr̀ɪnt] ..... 'reprint' (N)	

3. [m~m̩ n~n̩]

[pʰr̥ízm̩] ..... 'prism'	[fɪlm]~[fílm̩] ..... 'film'
[míšn̩] ..... 'mission'	[swɔrm] ..... 'swarm'
[ʔɔ́fn̩] ..... 'often'	[barn] ..... 'barn'
[hévn̩] ..... 'heaven'	[džɔyn] ..... 'join'
[bə́ʔn̩] ..... 'button'	[ʔédnə] ..... 'Edna'
[wépn̩] ..... 'weapon'	[kʰæbnət]~[kʰæbn̩ət] .... 'cabinet'
[mærm̩] ..... 'madam'	[ʔækni] ..... 'acne'
[blədžn̩] ..... 'bludgeon'	[dízml̩] ..... 'dismal'
[pʰégn̩] ..... 'pagan'	[mægnət] ..... 'magnet'
[békn̩] ..... 'beckon'	

4. Canadian English [əy~ay əw~aw]

[bəyt] ..... 'bite'	[bayd] ..... 'bide'	[həws] ..... 'house' (N)	[hawz] ... 'house' (V)
[tʰəyp] ..... 'type'	[rayz] ..... 'rise'	[əbə́wt] ..... 'about'	[ráwri] ..... 'rowdy'
[ləyf] ..... 'life'	[brayb] .. 'bribe'	[kʰəwtš] ..... 'couch'	[naw] ..... 'now'
[tʰəyk] ..... 'tyke'	[day] ..... 'die'	[dəwt] ..... 'doubt'	[gawdž] ..... 'gouge'
[rəys] ..... 'rice'	[say] ..... 'sigh'	[məwθ] ..... 'mouth'	[pʰawnd] .... 'pound'

Greenlandic Eskimo

Notes: [λ] is a voiced lateral affricate;
[q] is a voiceless uvular stop;
[ʀ] is a voiced uvular fricative.
Be especially careful not to confuse [q] and [g].

1. [ivnaq] ..... 'bluff'
2. [ipeʀaq] ..... 'harpoon strap'
3. [imaq] ..... 'sea'
4. [tuluva] ..... 'raven'
5. [itumaq] ..... 'palm of hand'
6. [sava] ..... 'sheep'
7. [nuna] ..... 'land'
8. [ine] ..... 'room'
9. [nanoq] ..... 'bear'
10. [iseʀaq] ..... 'ankle'
11. [isse] ..... 'eye'
12. [seʀmeq] ..... 'glacier'
13. [qasaloq] ..... 'bark'
14. [ikusik] ..... 'elbow'
15. [qilaluvaq] ..... 'white whale'
16. [qatigak] ..... 'back'
17. [sakiak] ..... 'rib'
18. [ugsik] ..... 'cow'
19. [oʀpik] ..... 'tree'
20. [neʀλoq] ..... 'goose'
21. [maʀʀaq] ..... 'clay'
22. [iga] ..... 'pot'
23. [igλo] ..... 'house'
24. [sako] ..... 'tool'

Greenlandic Eskimo has 5 phonetic vowels [i e a o u].

Based on the data above, how many distinct vowel phonemes does it have?

State below the vowel phonemes, with their allophones and conditioning environments.

A few things Americans can do to improve their accent in various languages

- **Don't use alveolar stops**. English /t/ and /d/ are pronounced further back in the mouth than the corresponding phonemes in most languages. Try to make the tip of your tongue actually touch the back of your front teeth when pronouncing /t/ and /d/. You may not notice the difference, but your conversation partners definitely will.

- **Don't aspirate voiceless stops**. Syllable-initial /p/, /t/, /č/, and /k/ are pronounced with strong aspiration in American English (respectively, [p^h], [t^h], [$č^h$], and [k^h]), but are **not** in most European languages. Learn to pronounce the **unaspirated** versions, which occur in English words like *spot* [spat] and *sketch* [skɛč], and use them **only**.

  There are also languages like Hindi or Chinese in which aspirated and unaspirated stops are phonemically distinct; in these languages, making this distinction is crucial, because if you use the wrong sound, you won't just say something with an American accent — you may well wind up saying something else altogether by mistake.

- **Pronounce each syllable fully**. English is a **stress-timed** language, which means that we take about the same amount of time to pronounce "stress groups" (i.e, whatever lies between [succéssive stréssed sýllables in an útterance), no matter hów many sýllables there áre in the gróup]. This leads to a lot of contraction of consonants and reduction of vowels in unstressed syllables in English (see below).

  Most other languages, however, are **syllable-timed**, which means that every syllable takes about the same amount of time to pronounce, whether it's stressed or not. In speaking such a language, learn to set your metronome at the syllable level; it'll make the language easier to speak, and you easier to understand speaking it.

- **Give each vowel its full value**. Since English is stress-timed, we tend to pronounce full vowels only when they're stressed; the remainder are reduced, usually to [ə] or some other centralized vowel. This is emphatically **not** true in most languages, however. It is very important to get into the habit of pronouncing each vowel as a full vowel in almost every language. Even if there is some reduction in a language (e.g, Russian), that reduction is certain to be done differently from the way it's done in English, and will have to be learned separately anyway.

- **Don't diphthongize your vowels**. American English tense vowel phonemes (especially /e/ and /o/) are phonetically diphthongs (respectively, [e^i] and [o^u]). Most other languages use "pure" vowels instead of diphthongs for these sounds. Learn to hear the glides and avoid them in other languages, unless they're specifically called for — for instance, Spanish would spell American /e/ as "ei" and /o/ as "ou".

Some examples of how to improve your accent in a couple of languages

- **German** long vowels are tense, and short vowels lax, not unlike English — but in standard High German the long vowels actually *are* longer; i.e, they are held for a longer time. German also has two **front rounded** vowels: one **high** /ü/, and one **mid** /ö/. /ü/ can be pronounced by saying either English /i/ if it's long, or /ɪ/ if it's short, with your lips **rounded**. /ö/ can be pronounced by saying either English /e/ if it's long (but remember, No Diphthongs!) or /ɛ/ if it's short, with your lips **rounded**.

  German also has two fricatives that don't occur in English. Like the difficult English sounds /θ/ and /ð/ (both spelled 'th'), these are both spelled 'ch' in German. After back vowels (/a/, /o/, /u/), German 'ch' is pronounced [x], a **voiceless velar fricative**, in the same position as [k] but without a full stop of the breath. Elsewhere, it is pronounced [ç], a **voiceless flat palatal fricative** in much the same position as [š], but without its sibilant groove in the tongue. This alternation is allophonic in German.

  After a vowel, the German /r/ is pronounced as [ə], much the same way it is in British or Boston dialects of English. Elsewhere, there are two possibilities for pronouncing the /r/ phoneme; these vary dialectally, and either is acceptable in most contexts. The more common one is [ʀ̃], a **uvular trill**, made at the extreme back end of the velum. Many Americans find this sound hard to produce at first. The other one, common in Southern dialects and equally acceptable (and the standard for the stage and for singing), is [r̃], an **apical trill**, exactly the same as the Spanish 'rr'.

  Finally, all German **voiced obstruents are devoiced** at the end of the word, so *ob* is pronounced [op], *Land* is pronounced [lant], etc.

- **Spanish** has no difficult vowels. The only thing to remember is that they must be pure; and that Spanish is syllable-timed, so each syllable, and its vowels, must be pronounced fully, whether stressed or not.

  There are two 'r' phonemes: /r/, an **apical tap** or **flap**, which is pronounced like the intervocalic /d/ or /t/ in English 'bidding' [bɪ́rɪŋ] or 'betting' [bɛ́rɪŋ], and is always spelled with a single 'r'; and /r̃/, an **apical trill**, which is essentially a repeated tap in the same place as /r/. /r̃/ is spelled as 'rr' between vowels, and as 'r' at the beginning of words, where it is the only 'r'-sound that occurs. /r/ is never found initially in a word.

  Spanish **voiceless stops** are never aspirated; and Spanish /d/, /t/, and /n/ are always **dental**. Spanish **voiced stops** are pronounced as **voiced fricatives** between vowels. For instance, /aba/ is pronounced [aβa] (English /ava/ will do as a substitute; but note that Spanish /b/ can be spelled **either** 'b' **or** 'v'; both are identical in this way); /ada/ as [aða] ([ð] is exactly the same sound as in English 'either' [iðɚ]); and /aga/ as [aɣa] ([ɣ] is a **voiced velar fricative**, the voiced counterpart of German 'ch' [x]).

The Umlaut Convention

The German word 'Umlaut' (*um* 'around' + *Laut* 'sound') refers to the double-dot diacritic that appears over certain German vowels, and to those vowels themselves. In English this diacritic mark is called 'diëresis', and is optionally used to mark the pronunciation of a vowel that would otherwise be interpreted as silent, e.g. *coöperate*, *naïve*, etc.

These German umlaut vowels are all front vowels that are derived, historically or morphologically (or both), from corresponding back vowels. There are three of them: **ü**, **ö**, and **ä** (plus a diphthong **äu**), which are represented in IPA as [y], [ø], [ɛ] (and [oi]), respectively. They are often spelled **ue**, **oe**, **ae**, and **aeu** when umlauts are not available. **ü** and **ö** are front rounded vowels, respectively high and mid. German vowels often are 'umlauted' in some constructions; e.g, *alt, älter, ältest* 'old, older, oldest', or *Mann, Männer* 'man, men'. Historically, this is also the source of the *e*'s in the irregular English forms *men* and *eldest*. English is a Germanic language.

While the IPA has adopted the spelling conventions of the Scandinavian languages for front rounded vowels, the umlaut convention has also been applied more generally to represent vowels that differ in rounding from the default ('unmarked') value, especially for non-low vowels.

The **default** (normal, unmarked) vowel values are:

(default: Unrounded)	Front	Back (default: Rounded)
High:	[i]	[u]
Mid:	[e]	[o]

The **marked** vowel values are:

(marked: Rounded)	Front	Back (marked: Unrounded)
High:	[ü]	[ï]
Mid:	[ö]	[ë]

I.e, an umlaut vowel has the **same** value for the features of Height [high, mid, low] and Rounding [rounded, unrounded] as the non-umlauted vowel does, but it has the **opposite** value for Frontness [front, back]. This convention captures the generalization that the default values for rounding differ with frontness, as well as having a single diacritic for highly marked (and therefore less common) vowels, and no diacritic for unmarked vowels. While it's not an international standard like the IPA, it's still a good example of useful transcription practice.

Some other variants, useful when Tenseness [tense, lax] is a significant feature, are [i], [ü], [ö], and [ë], which are (respectively) the lax versions of [ï], [ü], [ö], and [ë].

Some Distributional Properties in Phonology

Phones: phonetic representations of actual sounds that occur in a language, without reference to the phonemes that they represent.

Allophones: phones considered as members of particular phonemes. E.g, since the phones [t], [t^h], [ɾ], and [ʔ] all represent the English phoneme /t/, [t], [t^h], [ɾ] and [ʔ] are all allophones of /t/.

Phonemes: abstract representations of the 'distinctive' sound units of a language. Each phoneme has at least one allophone as its phonetic manifestation.

Minimal pair: a pair of words with different meanings that are phonetically identical, except that one word has one sound in a position where the other word has a different sound. Minimal pairs are used to show that two sounds are in contrast, i.e., that they represent different phonemes.

Environment: the phonetic position in which a sound appears.

Distributional relationships

Contrast: two sounds are in contrast if they occur in the same environment and the substitution of one for the other changes the meaning of the word (e.g. English [f] and [v] are in contrast given the minimal pair [fæt] 'fat' - [væt] 'vat'.

Free variation: two sounds are in free variation if they occur in the same environment and can be freely interchanged with each other without changing the meaning of the word (e.g. English [d] and [ɾ] are in free variation in [ɹáːydɻ]/[ɹáːyɾɻ] 'rider'). Two sounds in free variation with each other are allophones of the same phoneme.

Complementary distribution: two sounds are in complementary distribution if they never occur in the same environments; the 'distribution' (position of occurrence) of the one sound is the 'complement' of the distribution of the other (e.g. English [a] and [ã] are in complementary distribution since [ã] only occurs before nasal consonants and [a] occurs anywhere except before nasal consonants). Two phonetically similar sounds in complementary distribution are (probably) allophones of the same phoneme.

Tips for Working Phonology Problems

The **DATA** generally consist of the phonetic representations for a set of unrelated words, illustrating the distribution in the language of two or more sounds.

The main **QUESTION** asked about the data is: are sounds [X] and [Y] in complementary distribution or contrast? There may be a number of pairs of suspect sounds in the data. In the case of a full phonemic analysis, all suspicious pairs must be compared.

STEPS in working the problem:

1. Look for a minimal pair differing only in that one word has [X] where the other has [Y], and the words differ in meaning. If you find a minimal pair,then [X] and [Y] are IN CONTRAST and they are allophones of different phonemes.2. If there is no minimal pair, [X] and [Y] may be in complementary distribution. To find this out, determine the phonetic environment in which each occurs, as follows:
   a. List the environments in which [X] occurs, listing at least the immediately preceding and the immediately following sound or boundary (and maybe stress or the lack of it). Do the same for [Y].
   b. If the environments you have listed for [X] and [Y] overlap (i.e., some environments are the same for the two sounds), look back at the data and try to find some way of making the two sets of environments distinct (e.g., by listing more surrounding sounds or boundaries than just the immediately preceding and following ones).
   c. Once you have distinct sets of environments for [X] and [Y], try to make a generalization about each set. E.g., if [X] occurs before [i] and [e], while [Y] occurs before [u], [o], and [a], then you can make the generalization that [X] occurs before front vowels and [Y] occurs before back vowels. (Note that it may be only the preceding or only the following environment that is relevant in the generalization.)

3. If you are unable to make separate generalizations about the distribution of [X] and [Y], then (assuming you haven't missed a regularity) [X] and [Y] are probably IN CONTRAST and allophones of different phonemes. (You would expect additional data to show minimal pairs differing only in [X] and [Y].)

OR

3'. If you are able to make separate generalizations about the distribution of [X] and [Y], then [X] and [Y] are in COMPLEMENTARY DISTRIBUTION and they are probably allophones of the same phoneme.

4. If [X] and [Y] are allophones of the same phoneme (because they are in complementary distribution), then it is likely that one of them is identical to the phoneme and the other is derived from the phoneme by a phonological rule. In dealing with two sounds, [X] and [Y], there are always two obvious possibilities for the phoneme representation and the phonological rule:

   a. The phoneme is /X/ and the phonological rule is:
      X becomes Y in some environment 'Z'.

   OR

   b. The phoneme is /Y/ and the phonological rule is:
      Y becomes X in some environment 'W'.

5. To choose between these two possibilities, you must appeal to some principle or criterion. The criteria phonologists use include (but aren't limited to) ***simplicity*** (choose the rule that is simpler; this should coincide with choosing the allophone with the wider distribution), ***naturalness*** (choose the rule that is phonetically plausible), and ***pattern congruity*** (choose the rule that fits the pattern of similar sounds in language).

6. Once you have chosen a rule, you have also chosen a **PHONEMIC** representation. If the rule is X --> Y . . ., the phonemic representation for both [X] and [Y] is /X/; if the rule is Y --> X . . ., the phonemic representation for both [X] and [Y] is /Y/.

7. **A DERIVATION** for any word consists of the following three steps:
   a. Listing the phonemic representation.
   b. Listing the name of the rule and showing how it changes the phonemic representation (i.e., the result of applying the rule to the phonemic representation).

   AND

   c. Listing the phonetic representation, which is the result of applying the rule to the phonemic representation.

/ðə skórpiyən/

/bay/

/wɪl kə́pi/

/si ðə skórpiyən. wɪl ðə skórpiyən bayt? no, ɪf yu ar kaynd tu ðə skórpiyən ænd trit hɪm æz ə frɛnd, hi wɪl nat bayt yu. hi wɪl stɪŋ yu. skórpiyənz stɪŋ ðɛr pre, kənsístɪŋ əv spáydərz ænd ínsɛkts, tu mek ɪt bɪhév wayl ðe it ɪt. skórpiyənz ænd spáydərz ar nat ínsɛkts bət ərǽknədz, wɪθ et lɛgz. ínsɛkts hæv ónli sɪks lɛgz. wont yu tray tu rəmémbər ðæt?/[1]

/skórpiyənz ófən stɪŋ pípəl ɔn ðə hænz ən fit wɛn ənóyd ɔr dɪstárbd. ðe ólso stɪŋ ɔn jénərəl prínsəpəlz. ðe kéri ðɛr telz kərld óvər ðɛr bæks ænd ólwez stɪŋ ɪn frənt əv ðɛmsélvz. wɛn yu ar héŋɪŋ əráwnd ə skórpiyən, ste nɪr hɪz sə́ðərn ɛnd. yul ɛnjóy ɪt mɔr./[2]

/ðə póyzən əv ðə skórpiyənz stɪŋ ɪz séldəm fétəl tu larj mǽməlz, bət ɪt hərts sə́mθɪŋ fɪrs. wən kɛn, hàwévər, əkwáyr párʃəl ɪmyúnəti bay tékɪŋ ðə prápər steps. ɪf yu lɛt ə skórpiyən stɪŋ yu évri wəns ɪn ə wayl, ði əfékts bɪkám lɛs səvír ič taym, əntíl fáynəli ɔl yu nótəs ɪz ðə sènséšən əv bíyɪŋ stæbd wɪθ ən ays pɪk ænd ə slayt dízi fíliŋ fɔr sévərəl dez. ayv névər trayd ðɪs màysélf. wət wɪθ wən θɪŋ ən ənə́ðər, aym ólwəz pútɪŋ ɪt ɔf./[3]

/ðə skórpiyən lidz ə sálətèri layf for ðə most part, æz hi hæz ə lo əpínyən əv ol áðər skórpiyənz. ðe het ðɛr kaynd, ɛksépt ın me, jun, jəláy, ən ógəst, wɛn ðe go tə ði ápəsət èkstrím. ın ðiz mənθs ðə skórpiyən ænd ðə skòrpiyənés tek lɔŋ strolz, pínsər ın pínsər, stænd ɔn ðɛr hɛdz, ænd kéri ɔn rıgárdləs. ıt ízənt ləv, ríəli. ıts mɔr əv ə mæd ınfæčuwéšən./[4]

/ðɛn ðə skòrpiyənés dəvawrz hər met ænd ðæts ðə læst əv hım. simz əz ðo ðıs hæbət əv hərz wʊd gɛt əráwnd əmáŋ ðə fél̈əz, bət ðoz hu no most əbáwt ıt ar ın no kəndíšən tə mek ə rəpórt. bébi skórpiyənz rımén wıθ ðɛr máðər fər ðə fərst tu wiks, ráydıŋ ɔn ər bæk, frískıŋ mérəli ın ðə græs, ænd grówıŋ mínər évri mínət. ay səpóz ay ɔt tə fil sári fər skórpiyənz bıkóz ðe ar so ófəl. ayl θıŋk ıt óvər./[5]

---

1. /wɛl, yu nídənt gɛt sɔr ət mi. ay hæd náθıŋ tu du wıθ ıt./
2. /skórpiyənz kən bi kɛpt fər àbzərvéšənz ın ə glæs jar wıθ ə lıd ɔn ıt. dont fərgét ðə lıd./
3. /ıf yu θıŋk yu hæv skórpiyənz ándər yər bédrùm flɔr, rımémbər ðət skórpiyənz lıv ónli fayv yırz./
4. /boθ pártnərz ar ɛkstrímli rıpálsəv. fórčənətli, skórpiyənz hæv pʊr áysàyt./
5. /skórpiyənz névər stıŋ ðəmsélvz tə dɛθ, no mátər wət ðæt nays old jéntəlmən told yu. bət go əhéd ən bılív ıt, ıf yud ráðər. ðɛrz no lɔ əgénst ıt./

/ðə si sr̩pn̩t

bay

wɪl kə́pi/

/si sr̩pn̩ts r̩ larj̃ mərín ǽnəməlz əv most ənyúžəwəl hǽbəts n̩ əpírn̩s. ðe r̩ əbzr̩vd ónli ɪn wɔrm wéðr̩, jénr̩əli ən ógəst r̩ səptémbr̩, wɛn ðé əkéžənəli rayz tə ðə sr̩ſəs lɔŋ ənáſ tə rəlív ðə mənátəni bay ə čenj̃ əv kláymət n̩ sin. ðɛn ðe rətr̩n tə ðɛr homz ət ðə bátm̩ əv ði ósn̩ n̩ ste ðɛr n̩tɪl ðe fil lo ɪn ðɛr maynz əgén./

/si sr̩pn̩ts du nat kəm əp əz ɔſn̩ əz ðe fórmr̩li dɪd bəkóz əv wət pípl̩ se əbáwt ðəm. no súnr̩ ar ðe sin ɪn wən ples r̩ ənáðr̩ ðæn sámbədi poynts awt ðət ðɛr íz no səč θɪŋ. səm pípl̩ θɪŋk ðe ar ɔ́ſl̩i smart. æz no spésəmən əz ɛvr̩ bɪn kǽpčr̩d, si sr̩pn̩ts əv nat bɪn stádid əz kérfl̩i əz most áðr̩ ǽnəməlz, n̩ fyu pípl no éniθɪŋ défənət əbáwt ðəm. ðæt əz wɛr áy kəm ɪn./

/si sr̩pn̩ts r̩ grínɪš ɔn tap n̩ yélowɪš əndr̩níθ. ðe hæv lɔŋ sléndr̩ nɛks n̩ telz, bət ðə sayz n̩ šep əv ðə bádi r̩ prábləmǽtəkl̩, sɪns most əv ɪt əz ólwéz éndr̩ wótr̩. éstəməts əv ðə tótəl lɛŋθ véri fræm sláytli lɛs ðən fíftin fit tu əbáwt twániθri maylz n̩ ə hæf./

/aywɪtnəs dəskrípšn̩z əv ðə si sr̩pn̩t dífr̩ so məč ðət méni θɪŋkr̩z əv gívn̩ əp ðə hol θɪŋ əz tu dífəkəlt. ðə kənflíktɪŋ əkáwns, əv kɔrs, mírli pruv ðət ðɛr r̩ sévr̩əl kaynz əv si sr̩pn̩ts. ðɛr məst bi. ðə nɔrwíjn̩ si sr̩pn̩t hæz ə hórsláyk hɛd ðə kálr̩ əv síwid, ə lɔŋ grin men (rəzémblɪŋ síwid), n̩ númr̩əs həmps r̩ bənčəz alóŋ əz bæk.[1,2] ðə wənz wɪð rɛd menz n̩ flémɪŋ ayz r̩ ə rɛr sábspisiz. ðoz wɪðáwt menz me bi fímelz.

/ðə nuwíŋgləənd si sr̩pn̩t lʊks əgzékli layk ən ol tri trəŋk, bábɪŋ əbáwt ɔn ðə wevz, wɪð ðə rʊts stíkɪŋ əp layk hɔrnz[3]. ðə mɪsl̩éniyəs si sr̩pn̩t ɪz ən əksépšn̩ tu ol rulz. ðə lak nɛs mánstr̩ wəz əv ðɪs tayp. so wəz ði ábjəkt sáytəd bay fayv névəl ófəsr̩z ɔn ə fíšɪŋ trɪp nɪr hǽləfæks n̩ éttinθr̩tiθrí. bɔy, wəz ðǽt ə párti./[4]

/ɪn may əpínyən si sr̥pn̥ts əv sr̥váyvd frəm príyəstɔrək taymz, wɛn ðə wr̥ld wəz yəg n̥ fúləš. mos prəfésr̥z se ət əz əmpásəbl̥ ðət éni əv ðoz kríčr̥z šud stɪl əgzíst. ðe me bi məstékn̥. ay kánstəntli mit píp l̥ hu r̥ səpráyzd áy stɪl əgzɪst./

/wən θɪg əbáwt si sr̥pn̥ts əpírz tə bi sr̥tn̥ - iðr̥ yu si ðəm r̥ yu dont. ðoz hu du hæv óɪwez ɪmprést mi əz jáli gud féloz n̥ kənvíviyl̥ km̥pænyn̥z wɪθ íntr̥stɪg poyns əv vyu n̥ ə rédi flo əv kanvr̥séšn̥. ðoz hu dont r̥ ófn̥ príti dræb. méni píp l̥ go θru layf wɪθáwt síyɪg ívn̥ ə lítl̥ wən. ayv névr̥ sin bət tu əv ðəm mayséIf./[5]

---

1. /ólso rəzémblɪg síwid./

2. /ðə pr̥sút n̥ kæpčr̥ əv ə larǰ pis əv flótɪg síwid bay kæptən frédrək smɪθ əv ðə šɪp píkən ɔn dəsémbr̥ twəniyétθ, éttinfɔrtiét, pruvz náθɪg wətévr̥. ðæt kud hæpn̥ tə ʔénibədi./

3. /ðɛn wayízn̥ɪt ən ol tri trəgk, áykn̥ ǰəst hír yu æskɪg. huz téIɪg ðɪs lay, yúwr̥mí?/

4. /kəmpér ðə pəkyúlyr̥ spíšiz dəskráybd, sámwət dífr̥əntli, bay évri mæn əbɔ̀rd ðə míni, bawnd fr̥ lívr̥pul wɪð ə kárgo əv rám, éttɪnsevn̥itú./

5. /náθɪg əz non əbàwt ðə ləv layf əv ðə si sr̥pn̥t. ɪt məst bi hɔ́rəbl̥./

/sǽmpəl fnɛks kwɪz/

Name____________________ /nem/ /____________________/

Write the word below in standard orthography. Spell correctly.

(1) /sʊt/ ____________________

(2) /lúsɚ/ ____________________

(3) /pálɪš/ ____________________

(4) /lúzɚ/ ____________________

(5) /gɚáž/ ____________________

(6) /mæt/ ____________________

(7) /sæd/ ____________________

(8) /sad/ ____________________

(9) /bɔk/ ____________________

(10) /réšəl/ ____________________

Transcribe the following words into phonetic notation:

(11) turn /____________________/

(12) vision /____________________/

(13) thigh /____________________/

(14) card /____________________/

(15) dew /____________________/

(16) thy /____________________/

(17) ton /____________________/

(18) fairy /____________________/

(19) fission /____________________/

(20) meet /____________________/

Linguistics 210 Phonetics Quiz Name_____

20 points total.

Give **full** articulatory descriptions for the following sounds: (one point each)

[ɡ] _____

[ɛ] _____

[ŋ] _____

[ž] _____

[ö] _____

[θ] _____

[e] _____

[ə] _____

[ɬ] _____

[ñ] _____

Give the phonetic symbols of all and only the sounds described: (one-half point each)

<u>voiceless</u> dental nasal	[ ]
labiodental fricatives	[,]
voiced palatal sibilant	[ ]
high back rounded vowels	[,]
high front rounded vowel	[ ]
velar stops	[,]
voiceless retroflex stop	[ ]

An American English Dialect

	Phonetic	*Phonemic*	*Gloss*		*Phonetic*	*Phonemic*	*Gloss*
1	[sæ:lɪt]	/sælɪd/	salad	21	[bɛ́t]	/bɛ́t/	bet
2	[sæ:lɪdz]	/sælɪdz/	salads	22	[ræ:bɪt]	/ræbɪt/	rabbit
3	[bɛ́:d]	/bɛ́d/	bed	23	[ræ:bɪts]	/ræbɪts/	rabbits
4	[bɛ́:dz]	/bɛ́dz/	beds	24	[rɪsɪ́t]	/rɪsɪ́t/	reseat
5	[stú:pɪt]	/stúpɪd/	stupid	25	[rɪsɪ́:rɨt]	/rɪsɪ́dɨd/	receded
6	[stú:pɪdlɪ]	/stúpɪdlɪ/	stupidly	26	[rǽpɪt]	/rǽpɪd/	rapid
7	[rɪsɪ́rɨt]	/rɪsɪ́tɨd/	reseated	27	[rǽpɪdz]	/rǽpɪdz/	rapids
8	[bæ:lɪt]	/bælɪd/	balad	28	[ræ:bɪt]	/ræbɪd/	rabid
9	[bæ:lɪdz]	/bælɪdz/	balads	29	[ræ:bɪdlɪ]	/ræbɪdlɪ/	rabidly
10	[tʰɛ́pɪt]	/tɛ́pɪd/	tepid	30	[rɪsɪ́:d]	/rɪsɪ́d/	recede
11	[bɛ́:rɪŋ]	/bɛ́dɪŋ/	bedding	31	[háyt]	/háyt/	height
12	[rɪpʰɪ́t]	/rɪpɪ́t/	repeat	32	[wé:d]	/wéd/	wade
13	[wɛ́t]	/wɛ́t/	wait	33	[wé:rɨt]	/wédɨd/	waded
14	[wɛ́rɨt]	/wɛ́tɨd/	waited	34	[tʰrá:y]	/tráy/	try
15	[há:yd]	/háyd/	hide	35	[bɛ́rɪŋ]	/bɛ́tɪŋ/	betting
16	[tʰrá:yd]	/tráyd/	tried	36	[tʰráyt]	/tráyt/	trite
17	[rɪpʰɪ́rɨt]	/rɪpɪ́tɨd/	repeated	37	[ráyrɪŋ]	/ráytɪŋ/	writing
18	[rá:yrɪŋ]	/ráydɪŋ/	riding	38	[kʰéri]	/kéti/	Katy
19	[skérɪŋ]	/skétɪŋ/	skating	39	[fé:rɪŋ]	/fédɪŋ/	fading
20	[skérɨt]	/skétɨd/	skated	40	[fé:rɨt]	/fédɨd/	faded

In the data above, note the differences between the phonemic representations of the words and their actual phonetic shapes. There are **five** separate interacting phonological processes involved in producing these differences. These processes allow one to predict the distribution of:

- centralized diphthongs.....[əy]
- taps .....[ɾ]
- final dental stops.....[t, d]
- aspirated stops.....[t^h, k^h, p^h]
- long vowels.....[e:, ɛ:, etc.]

(given the phonemic representations). Discover and state clearly rules for how each of these five processes works: what changes to what, and under what circumstances, and what order do they need to be applied in? Find an example where applying rules in the wrong order produces an incorrect form. (2 pages max.)

Hint: Stressed vowels [é, etc.] are important; don't ignore them.

GERMAN

1. axt	eight	8. ɪç	I
2. bux	book	9. ɛçt	real
3. lɔx	hole	10. laxən	to laugh
4. hox	high	11. lɛçəln	to smile
5. rawxən	to smoke	12. rayçən	to reach
6. mɛ:dçən	girl	13. möçst	[you sg] would like
7. çɛmi:	chemistry	14. büçər	books

The voiceless velar fricative [x] and the voiceless palatal fricative [ç] are in complementary distribution and are allophones of the same phoneme. Pick one allophone as basic, and give the rule that will derive the other allophone from it.

SWAHILI

[ɔ]		[o]	
1. ŋgɔma	drum	12. watoto	children
2. bɔma	fort	13. ndoto	dream
3. ŋɔmbe	cattle	14. mboga	vegetable
4. bɔmba	pipe	15. ndogo	little
5. ɔmba	pray	16. ǰogo	rooster
6. ɔna	see	17. šoka	ax
7. pɔña	cure	18. okota	pick up
8. ñɔña	nurse	19. moǰa	one
9. ɔñǰa	taste	20. mtego	trap
10. ɔŋgeza	increase	21. kʰɔndo*	sheep
11. ñɔŋga	strangle	22. karɔŋgo*	wash-out

The vowel [ɔ] (lower, or more open) and [o] (higher, or more closed) are in complementary distribution and are allophones of the same vowel phoneme. Pick one of them as basic and derive the other from it. (Forms marked "*" contain both allophones.)

JAPANESE

1. haši	chopsticks	5. hõhõ	method
2. soɸu	grandfather	6. ɸuku	clothes
3. hei	fence	7. çidari	left
4. kõçɾ	coffee	8. haha	mother

The voiceless fricatives [ɸ], [ç], and [h] (bilabial, palatal, and velar, respectively) are in complementary distribution, and are allophones of the same phoneme. Pick one as basic and derive the rest from it.

Hausa (Afro-Asiatic)

bʷuhu ..... sack	bʷo:ye ..... hide	karɓa: ..... receive
gani: ..... see	kʷuɗi ..... money	sa:bʷo: ..... new
ƙalau ..... very	kʷunne: ..... ear	ƙʷo:fa: ..... doorway
kʷo: ..... or	ba:kʸi: ..... mouth	kʸe: ..... you
lo:katši: ..... time	ka:re: ..... finish	ɗaukʸe ..... take
dža:kʸi ..... donkey	gʸida: ..... house	gʷobe ..... tomorrow
kʷo:yo: ..... learn	gabas ..... east	ka:ta:kʷo: ..... lumber
ƙarše: ..... end	kʷusa ..... near	ɓʷuntu ..... rice-husks
le:ɓe ..... lip	kare: ..... dog	kʷullum ..... everyday
saukʸi ..... ease	gʷumi: ..... sweat	ƙʷundu: ..... gizzard
ba:ya: ..... back	biyu ..... two	

Phonetically, Hausa has the following set of bilabial and velar stops:

[b bʷ ɓ ɓʷ k kʷ kʸ ƙ ƙʷ ƙʸ g gʷ gʸ]

(1) How many bilabial stop phonemes are there in Hausa?
State the distribution.

(2) How many velar stop phonemes are there in Hausa?
State the distribution.

Note: [bʷ ɓʷ kʷ kʷ gʷ] are labialized stops
(i.e., produced with rounded lips).
[kʸ kʸ gʸ] are palatalized stops
(i.e., produced with the tongue body raised toward the palate).
[ƙ ƙʷ ƙʸ] are ejective stops
(i.e., produced with a simultaneous glottal closure).

CANADIAN FRENCH

1.	abɪm	abyss	15.	plozɪb	plausible
2.	avɪ	advice	16.	vɪt	quickly
3.	katɔlɪk	Catholic	17.	režɪm	regime
4.	šɪk	chic	18.	rɪš	rich
5.	vɪd	empty	19.	mirakl̥	miracle
6.	enɛrži	energy	20.	si	saw
7.	frɑ̃sɪn	Francine	21.	žɪg	shank
8.	kɔ̃pri	included	22.	lɪs	smooth
9.	vi	life	23.	spɔrcɪf	sporty
10.	vizaž	face	24.	ekɪp	team
11.	lɪñ	line	25.	mɛrsi	thanks
12.	pɪp	pipe	26.	fɪl	wire
13.	pise	urinate	27.	dine	dine
14.	miñõ	tiny			

The high front vowels [i] (higher) and [ɪ] (lower) are in complementary distribution and are allophones of the same vowel phoneme. State the distribution for the two allophones.

2.19 VOICELESS VOWELS IN JAPANESE

There is a phonological rule in Japanese that *devoices* certain vowels, with an effect something like a whispered vowel. Whether or not this devoicing takes place depends on several factors, including the rate and style of speech: the faster and more casual the speech, the more devoicing.

The data below, given in phonetic transcription, illustrate this phenomenon. Some of the symbols used deserve special comment. [ɯ] represents a high, back, unrounded vowel; [ɸ] is a voiceless bilabial fricative; [ç] is a voiceless palatal fricative, similar to the first sound of the English word *hue*. If a vowel has a small circle beneath it, it is "eligible" for devoicing, in the sense that it will be devoiced in at least some styles of speech; vowels without this symbol are never devoiced. The apostrophe indicates the position of the Japanese pitch accent[1].

Analyze these data to discover the rule or rules that determine which vowels are eligible for devoicing. Your goal is to come up with a brief paragraph that will describe in general terms—as far as can be determined from the data—the exact conditions under which devoicing can take place. The following questions should guide your analysis:

1. Do all Japanese vowels participate in the process or only certain ones? If the latter, what if anything sets these vowels apart from the others?
2. Does the process depend on the neighboring sounds? If so, how?
3. Does it depend on position in the word (initial, medial, final)?
4. Is the accent involved? If so, what effect does it have on whether or not devoicing can take place?

Make sure that your analysis correctly accounts for all the data presented! (Data adapted from Jorden 1963.)

1.	hatake	'dry field'	2.	sɯkiyaki	'sliced beef dish'
3.	sošite	'and then'	4.	mɯra'saki	'purple'
5.	watarɯ	'go across'	6.	watasɯ	'hand over'
7.	t͡sɯki'	'moon'	8.	t͡sɯ'kɯ	'arrive'
9.	sašimi'	'raw fish dish'	10.	mo'šimoši	'hello (on telephone)'
11.	čito'ri	'one person'	12.	čito't͡sɯ	'one unit'
13.	sɯko'ši	'a small quantity'	14.	bo'kɯtačі	'we'
15.	ɸɯkɯ'	'clothing'	16.	kimoči	'mood'
17.	ha'ši	'chopsticks'	18.	gakɯsei	'student'
19.	haši'	'bridge'	20.	ɸɯ'kɯ	'blow'
21.	sɯgi'rɯ	'exceed'	22.	šinbɯn	'newspaper'
23.	kitto	'certainly'	24.	kɯši'	'a comb'
25.	sɯki'	'pleasing'	26.	watakɯši	'I'
27.	sɯši'	'sushi'	28.	sɯmi'	'ink stick'
29.	čikima'šita	'pulled'	30.	čiči'	'father'
31.	ičі'	'one'	32.	ɯsagi	'rabbit'
33.	kɯt͡sɯ'šita	'socks'	34.	čika'šit͡sɯ	'basement'
35.	kabɯki	'kabuki (theater)'	36.	ne'kɯtai	'necktie'
37.	čikatet͡sɯ	'subway'	38.	sɯpɯ'ɯn	'spoon'
39.	kakika'ta	'style of writing'	40.	ito'ko	'cousin'

[1]The nature of the pitch accent, while not relevant to this problem, is quite interesting. The accent indicates the location of a high–low pitch transition: the syllable or part of a syllable preceding the accent is at a high pitch, and is immediately followed by a fall in pitch. When the accent occurs after the last syllable, the pitch fall is "potential," and is only manifested when certain particles are attached to the word. Note that it is perfectly possible for a multi-syllabic word not to have a pitch accent. (See Shibatani 1990:177ff.)

Spanish. Below are data for nine "different" Spanish sounds. Be able to give full articulatory descriptions of each and to locate each on the consonant chart: [b], [p], [β], [t͡], [d͡], [ð], [k], [g], [ɣ].

1. bóða ..... wedding	11. koβíxa ..... blanket	21. fálda ..... skirt
2. t͡akíto ..... little taco	12. úβa ..... grape	22. mi l á ɣ ro ... miracle
3. séβo ..... fat	13. pápa ..... Pope	23. dónde ..... where
4. sópa ..... soup	14. kasa ..... house	24. áða ..... given
5. péso ..... weight	15. búr̃o ..... donkie	25. bóða ..... wedding
6. béso ..... kiss	16. áβe ..... bird	26. kúβo ..... cube
7. ust͡éð ..... you	17. míɣa ..... crumb	27. dormíðo ..... slept
8. pɣéðra ..... rock	18. óŋgo ..... mushroom	28. lóβo ..... wolf
9. liβert͡áð ..... liberty	19. goβernár ..... govern	29. á ɣ o ..... I do
10. bóɣa ..... vogue	20. gát͡o ..... cat	30. ámbos ..... both

How many phonemes do these sounds represent?
Describe them fully.
What phonological generalization can be made about these sounds?

Korean. There are three sibilants in Korean

[s]	[š]	[z]
1. satan .... division	8. šeke ..... world	15. čaŋza ..... business
2. sæk ..... color	9. šekʉm ..... taxes	16. inza ..... greetings
3. sæ ..... new	10. šesušil* . washroom	17. inzweča ..... publisher
4. sosal ..... novel	11. šihap ..... game	18. paŋzak ..... cushion
5. su ..... number	12. šiktaŋ .. dining room	19. phuŋzok ..... custom
6. sul ..... wine	13. šilsu* ..... mistake	20. ʉmzikčam ... restaurant
7. susul .. operation	14. šinpu ..... bride	21. yaŋzučʉŋ ..... receipt

How many phonemes do these sounds represent?
Describe them fully.
What phonological generalization can be made about these sounds?

Lushootseed (Skagit; Salishan) Phonemes

Stops	[vl]	p	t	c[1]	č		k	kʷ	q	qʷ	ʔ
	[glot]	ṗ	ṫ	ċ	č̓	x̌[2]	k̓	kʷ̓	q̓	qʷ̓	
	[vd]	b	d	j	ǰ		(g)[3]	gʷ			
Fricatives	[vl]			s	š	ɬ		xʷ	χ	χʷ	h
Resonants	[vd]	w			y	l					
	[glot]	ẇ			ẏ	l̓					
Nasal	[glot]	(m̓)[4]									

Vowels[5]	[high][6]	i		u
	[mid][7]		ə	
	[low]		a	

1. / c/ and / j/ represent the alveolar affricates [t͡s] and [d͡z], respectively.
2. / x̌/ represents [tɬ], a voiceless ejective (rather palatalized) lateral affricate; there is no corresponding plain or voiced lateral affricate.
3. Occurs in one root only, /gə́dəgəd/ 'tickle'.
4. Occurs in one root only, /m̓ím̓aʔd/ 'small'. Puget Salish is one of very few languages (three of which – Quileute, Nitinat, and Skagit – are Northwest Indian languages, though unrelated, and separated spatially) in which nasal consonants do not occur. Proto-Salishan nasals have mutated into voiced stops in Skagit, a change that can be shown to have occurred since contact was initiated with Europeans.
5. The (rare) long vowels are written as geminates. Thus, / hiiɬ/ '(be) happy'. There are three degrees of sentence stress; primary / ´/ and secondary / `/ occur only in roots. Unmarked stress is the norm in affixes.
6. The high vowel phonemes / i/ and / u/ have the respective mid allophones [e] and [o] in the environment of the postvelar consonants (the various / q/ 's and / χ/ 's). Thus the interrogative predicate / ʔəχ íd/ '(be) how?' is pronounced [ʔəχéd].
7. There are three phonologically distinct schwas. Stressed [ə́] always represents the segmental phoneme / ə/ in its own right, but an unstressed [ə] might be / ə/ , or an unstressed allophone of the phoneme / a/ , or the result of epenthetic cluster reduction.

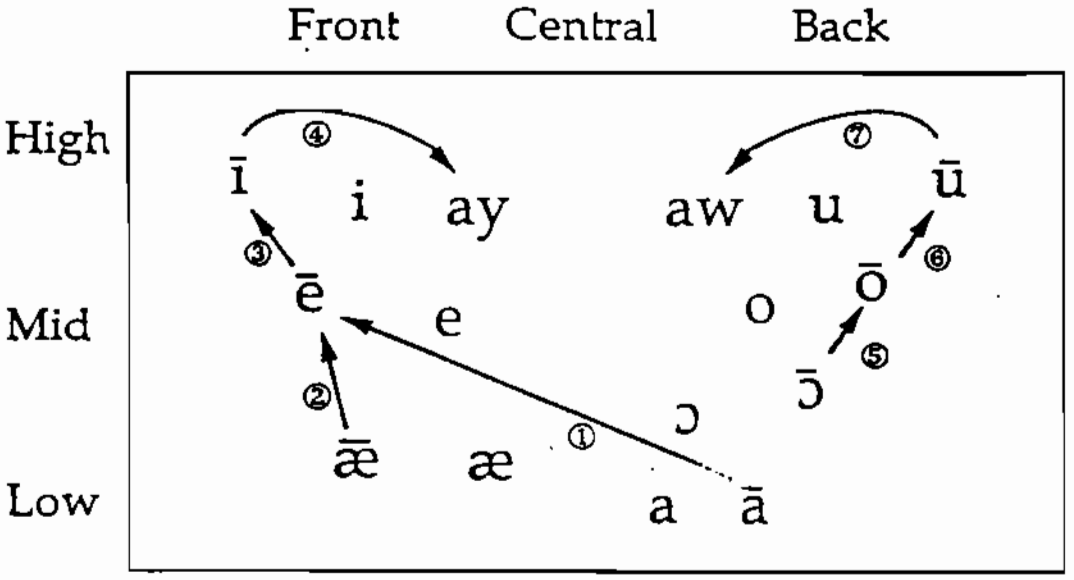
Proto-Indo-European Numerals

(PIE forms and selected reflexes, with Hungarian for contrast)

	PIE	Skt	Gk	Lat	Goth*	OIr	Hung
1	*oykos, *oynos	ékas	heîs	ūnus	ains	oín	egy
2	*dwōw	dvấu	dúō	duo	twai	da	kettő
3	*treyes	tráyas	treîs	trēs	þreis	tri	három
4	*kʷetwōres	catvấras	téttares	quattuor	fidwor	cethir	négy
5	*peŋkʷe	páñcn	pénte	quinque	fimf	cóic	öt
6	*seks	ṣáṭ	héx	sex	saihs	sé	hat
7	*septm̥	saptá	heptá	septem	sibun	secht n-	hét
8	*oktōw	aṣṭấu	oktő	octō	ahtau	ocht n-	nyolc
9	*newm̥	náva	ennéa	novem	niun	noí n-	kilenc
10	*de-km̥	dáśa	déka	decem	taihun	deich n-	tíz

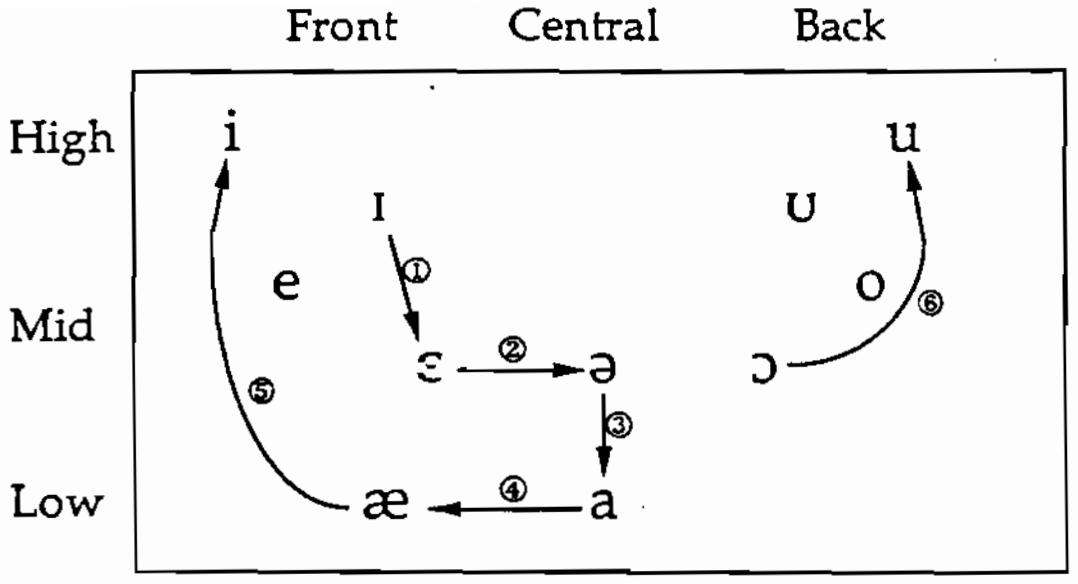
*m̥	⟶	a	a	em	un	n-
*d	⟶	d	d	d	t	d
*t	⟶	t	t	t	þ	t
*k	⟶	k /_V_{back}, c, ś *elsewhere*	k	k	h	k
*kʷ	⟶	"	t	kʷ (*qu*)	f	k
*p	⟶	p	p	p	f	Ø
*s	⟶	s	h *initially*, s *elsewhere*	s	s	s

* Grimm's Law applies in Gothic, as in all Germanic languages. Note the systematic changes in consonant reflexes in this column.



❶	ā → ē	[na:mə] → [ne:m]	'name'
❷	ǣ → ē	[bræ:ken] → [bre:k]	'break'
❸	ē → ī	[ge:s] → [gi:s]	'geese'
❹	ī → ay	[mi:s] → [mays]	'mice'
❺	ɔ̄ → ō	[brɔ:ken] → [bro:k]	'broke'
❻	ō → ū	[go:s] → [gu:s]	'goose'
❼	ū → aw	[mu:s] → [maws]	'mouse'

The Great Vowel Shift



❶	ɪ → ɛ	'wrist'	[rɛst]
❷	ɛ → ə	'well'	[wəɬ]
❸	ə → a	'unhappy'	[anhápi]
❹	a → æ	'Don'	[dæn]
❺	æ → ɛə → iə	'bad'	[bɛəd, biəd]
❻	ɔ → wɔ → uə	'coffee'	[kwɔ́fi, kúəfi]

The Northern Cities Chain Shift

1	अग्निभ्यस्	agnibhyas to fires	18	मुक्ति	mukti deliverance	35	स्तेन	stena thief
2	अश्व	aśva horse	19	पद्म	padma lotus	36	स्तोत्र	stotra song
3	आत्मन्	aatman self	20	पङ्क	paṅka mud	37	सर्वत्र	sarvatra everywhere
4	बल	bala strength	21	परशु	paraśu axe	38	सूक्त	suukta hymn
5	बाल	baala young	22	पत्नी	patnii wife	39	शब्द	śabda noise
6	भ्राम्यति	bhraamyati he wanders	23	पत्र	patra leaf	40	शास्त्र	śaastra book
7	ब्राह्मण	braahmaṇa brahman	24	प्रभूत	prabhuuta much	41	शिष्य	śiṣya pupil
8	गङ्गा	gaṅgaa Ganges	25	पुनर्	punar again	42	श्रुति	śruti scripture
9	ग्रन्थ	grantha book	26	पुरुष	puruṣa man	43	शूद्र	śudra shudra
10	गुरु	guru teacher	27	पुस्तक	pustaka book	44	श्वेत	śveta white
11	हस्त	hasta hand	28	पुत्री	putrii daughter	45	उपनिषद्	upaniṣad Upanishad
12	इन्द्र	indra Indra	29	रथ्या	rathyaa street	46	उषस्	uṣas dawn
13	इत्थस्	itthas thus	30	रत्न	ratna jewel	47	वस्त्र	vastra garment
14	लाङ्गल	laaṅgala plow	31	रूपक	rupaka gold piece	48	विद्या	vidyaa knowledge
15	मधु	madhu honey	32	सूर्य	suurya sun	49	विष्णु	viṣṇu Vishnu
16	माद्यति	maadyati he gets drunk	33	स्वप्न	svapna sleep	50	व्याध	vyaadha hunter
17	मार्ग	maarga way	34	स्वर्ग	svarga heaven	51	युद्ध	yuddha battle

The data consists of Sanskrit words in the Nagari writing system. The transcriptions are essentially phonemic. Identify the graphemes and their allographs. Describe the general structure of the writing system. 84