Linguistics 210
Introduction to Linguistic Analysis

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Part 1
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 underline 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 *hati* ‘liver’ is used in many of the same metaphors where *heart* 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 *bold underline*.

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

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 cliche 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) evtfikden .......................... 'from a little house'
7) deniztfikde .......................... 'in a little ocean'
8) elde .......................... 'in a hand'
9) elim .......................... 'my hand'
10) eller .......................... 'hands'
11) diller .......................... 'teeth'
12) dijimize .......................... 'of our teeth'
13) dijlerimiz .......................... 'of our tooth'
14) elfike .......................... 'to a little hand'
15) denizlerimizde .......................... 'in our oceans'
16) evtfikimde .......................... 'in my little house'
17) kuştfuklarımız .......................... 'our little birds'
18) kolumdan .......................... 'from my arm'
19) kıztfiklarınız .......................... 'to your[pl] little girls'
20) gülşüklerimin .......................... 'of my little roses'

2. Rotokas (East Papuan)

1) avaravere .......................... 'I'll go.'
2) avauvere .......................... 'You'll go.'
3) avarovere .......................... 'He'll go.'
4) pauaravere .......................... 'I'll sit.'
5) pauauvere .......................... 'You'll sit.'
6) paurovere .......................... 'He'll sit.'
7) vokaavere .......................... 'I'll walk.'
8) vokarivere .......................... 'You'll walk.'
9) vokarevere .......................... 'He'll walk.'
10) pauauvere .......................... 'I'll build (it).'
11) paurivere .......................... 'You'll build (it).'
12) paurovere .......................... 'He'll build (it).'
13) avaraepe .......................... 'I went.'
14) avarape .......................... 'You went.'
15) avaroepa .......................... 'He went.'
16) pauarepa .......................... 'I sat.'
17) pauape .......................... '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)

<table>
<thead>
<tr>
<th>Past Tense</th>
<th>Present Tense</th>
<th>Imperative</th>
<th>Infinitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>'take'</td>
<td>wásada</td>
<td>yiwásidal</td>
<td>wisad</td>
</tr>
<tr>
<td>'join'</td>
<td>gotán</td>
<td>yigotínál</td>
<td>gitán</td>
</tr>
<tr>
<td>'trade'</td>
<td>nagáda</td>
<td>yinagidál</td>
<td>nígád</td>
</tr>
<tr>
<td>'repeat'</td>
<td>digámamo</td>
<td>yìdágimal</td>
<td>dígám</td>
</tr>
<tr>
<td>'resemble'</td>
<td>misàla</td>
<td>yìmasilal</td>
<td>misál</td>
</tr>
<tr>
<td>'get down'</td>
<td>wàràdo</td>
<td>yiwaridál</td>
<td>wàrd</td>
</tr>
</tbody>
</table>

4. Mexican Spanish (Indo-European)

| 1 | mutsafsa          | 'boy'       |
| 7 | mutsafsa          | 'girl'      |
| 13| ixo               | 'son'       |
| 2 | tio               | 'uncle'     |
| 8 | tia               | 'aunt'      |
| 14| ixam              | 'daughter'  |
| 3 | sobrino           | 'nephew'    |
| 9 | sobrínna          | 'niece'     |
| 15| poeta             | 'poet'      |
| 4 | madre             | 'mother'    |
| 10| padre             | 'father'    |
| 16| ombre             | 'man'       |
| 5 | muser             | 'woman'     |
| 11| xente             | 'people'    |
| 17| amante            | 'lover'     |
| 6 | mutsafos          | 'boys'      |
| 12| mutsafas          | 'girls'     |
| 18| ixos              | 'offspring' |
| 19| buena xente       | 'nice people' |
| 20| muxeres biexas    | 'old women' |
| 21| mutsafos tikos    | 'little boys' |
| 22| amante guapo      | 'handsome lover' |
| 23| padres tikos      | 'rich parents' |
| 24| amantes guapas    | 'pretty lovers' |
| 25| mutsafas tijkas   | '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| ixos grande       | 'big son'    |
| 32| mutsafas pobre    | 'poor girl'  |

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### 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, prefixes, root change, suppletion, reduplication, etc.

<table>
<thead>
<tr>
<th>Derivational Morphemes</th>
<th>Inflectional Morphemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Can change part of speech or meaning; e.g., <em>-ment</em> forms nouns such as <em>judgement</em> from verbs such as <em>judge</em>.</td>
<td>Do not change part of speech or meaning; e.g., <em>big</em> and <em>bigger</em> are both adjectives.</td>
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<tr>
<td>2. Typically indicate semantic relations within the word, e.g., the morpheme <em>-ful</em> in <em>painful</em> has no particular connection with any other morpheme in a sentence, beyond the word <em>painful</em> itself.</td>
<td>Typically indicate syntactic or semantic relations between different words in a sentence, e.g., the present tense morpheme <em>-s</em> in <em>waits</em> shows agreement with the subject of the verb (both are third person singular).</td>
</tr>
<tr>
<td>3. Typically occur with only some members of a class of morphemes, e.g., the suffix <em>-hood</em> occurs with just a few nouns such as <em>brother</em>, <em>neighbor</em>, and <em>knights</em>, but not with most others, e.g., <em>friend</em>, <em>daughter</em>, <em>candle</em>, etc.</td>
<td>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.</td>
</tr>
<tr>
<td>4. Typically occur before inflectional suffixes (and after inflectional prefixes, though not in English); e.g., in <em>chillier</em>, the derivational suffix <em>-y</em> comes before the inflectional <em>-er</em>.</td>
<td>Typically occur at the margins of words, e.g., the plural morpheme *-*s always comes last in an English word, as in <em>babysitters</em> or <em>rationalizations</em>.</td>
</tr>
<tr>
<td>5. Instantiates 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.</td>
<td>Can instantiate categories that occur in paradigmatic sets; e.g., the categories of number and person produce the various forms of the verb: <em>I am</em>, <em>you are</em>, <em>he is</em>, <em>we are</em>, <em>you are</em>, <em>they are</em>.</td>
</tr>
</tbody>
</table>
Some Inflectional Categories

1. **NUMBER** (a category of Nouns; often agrees on other kinds of word)
   a. English: robot, robots
   b. Samoan: ʻoe 'you (one)'
      ʻouluʻa 'you two'
      ʻoutou 'you (more than two)'
   c. French: le livre ennuyant 'the boring book'
      les livres ennuyants 'the boring books'

2. **GENDER** (a category of Nouns; often agrees on other kinds of word)
   a. Spanish: las muchachas mexicanas
      las muchachas mexicanas
   b. Bariba: dum baka 'a big horse'
      yam bakanm 'a big space'
      kpêè bakanu 'a big stone'
      tam bakasu 'a big yam'
      boo bako 'a big goat'
      gàà bakanu 'a big thing'
      dönôn bako 'a big fire'
   c. Swahili: watu warnefika 'The men have arrived'
      visu vimeaunguka 'The knives fell'
      miti imekauka '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) talolle allative ('to')
      talon accusative (object) talona essive ('as')
      talon genitive ('of') talo partitive ('(part) of')
      talossa inessive ('in') taloksi translative ('(changes) into')
      talossa elative ('out of') talota abessive ('without')
      taloon illative ('into') taloin instructive ('with', 'by')
      talolla adessive ('on') taloing 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: ɲatyu kapa pulami 'I shout'
      ɲatyuluju kapaŋku nyuntu ɲanŋi 'I see you'
      nyuntuulu, kapaŋu ɲatyu ɲanŋi 'you see me'
   e. German: der gute Mann 'the good man'
      der guten Männer '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: folgbe (1pers), folgast (2pers), falgab (3pers) 'follow (sg)'
   c. Samoan: ima:ua ‘we two (excl)’ ima:tou ‘we (excl)’
      iia:ua ‘we two(incl)’ iia: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 prerečitel roman ‘I read (and finished) the book’
      ja čitai 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 ńeęq ‘I am leaving’
      noo ńeęvićuq ‘I want to leave’
   c. Turkish: kirajaksan ‘if you are going to break’
      kir + ajak + sa + n

8. VOICE (a category of Verbs, marking agent-patient relations)
   a. Latin: puella amat ‘the girl loves’
      puella amatam ‘the girl is loved’
   b. Amharic: ləkkəma ‘he picked’
      talejəma ‘he was picked’
      aləkkəma ‘he himself made someone pick’
      asələkkəma ‘he caused others to make someone pick’
      alləkkəma ‘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\textsubscript{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):
\( -\emptyset \) [i.e., Zero] in sheep, moose, fish, etc. \( -\text{al} \) in data, phenomena, opera, etc.
(Latin and Greek neuter nouns); \( -\text{ay}l \) in alumni, syllabi, etc. (Latin masculine nouns); \( -\text{el} \) in alumnae (Latin feminine nouns); \( -\text{an}l \) in oxen (Old English)
Irregular root modifications (lexically conditioned):
Final voiceless fricatives are voiced (\( /f/ \rightarrow /v/ \), \( /\theta/ \rightarrow /\delta/ \), \( /s/ \rightarrow /z/ \)) before adding regular suffixes in a class of nouns including hoof, leaf, life, path, and house.
Stem vowel change in:
- mice, lice (\( /\text{aw}/ \rightarrow /\text{ay}/ \)), plus Zero suffix
- men (\( /\text{m}/ \rightarrow /\text{el}/ \)), plus Zero suffix
- women (\( /\text{u}/ \rightarrow /\text{u}/ \)), plus Zero suffix
- children (\( /\text{ay}/ \rightarrow /\text{u}/ \)), plus irregular suffix \( -\text{an}l \)

(2) Nouns Possessive Enclitic { -Z\textsubscript{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\textsubscript{3} }
Regular suffixal allomorphs — identical to (1) above.
Irregular suffixal allomorph (lexically conditioned):
\( -\emptyset \) in she can, she will, she may, etc. (modal auxiliaries)
Irregular root modification: \( \text{have} + Z\textsubscript{3} = /hæz/ \) (\( /\text{v}/ \rightarrow \emptyset \) before \( -z/ \))
Irregular root suppletion: \( \text{be} + Z\textsubscript{3} = /lz/ \)

(4) Verbs Past Tense \(-\text{ED}\) { -ED }
Regular suffixal allomorphs, phonologically conditioned:
\( -\text{-l} \) after voiceless sounds, \( -\text{-d} \) after voiced sounds (including vowels)
(preceded by epenthetic \( /\text{al} \) or \( /\text{l} \) after dental stops \( /\text{d}/ \) and \( /\text{l}/ \))
Irregular suffixal allomorphs (lexically conditioned):
\( -\emptyset \) in some 1-syllable \( /\text{d}/ \) or \( /\text{l}/ \)-final verbs: beat, bet, burst, cast, cost, cut, hit, hurt, knit, let, put, rid, set, shed, shut, slit, shit, spit, split, spread, and thrust
\( /\text{d}/ \rightarrow /\text{l}/ \) in some 1-syllable \( /\text{d}/ \)-final verbs: bent, built, lent, sent, and spent.
\( /\text{-v} \) after some vowel-changed roots (others take \( -\emptyset \); see below)

1. All forms but one of \( \text{be} \) are irregular: \( /\text{em}/ \), \( /\text{z}/ \), \( /\text{ar}/ \), \( /\text{waz}/ \), \( /\text{war}/ \), \( /\text{un}/ \), cf. \( /\text{biy}/ \)
The Inflectional Suffixes of English

(4) Verbs Past Tense [-ED] (Continued)
Irregular root modifications (lexically conditioned):
  Pure vowel changes: kid, 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] = /went/

(5) Verbs Past Participle [-EN₁]
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: came, run, etc.
Irregular suffixal allomorph (lexically conditioned):
  /-en/ 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 /a/): sung, swung, drunk, swum, sprung, etc.

(6) Verbs Present Participle (Gerund) [-ING]
Regular suffixal allomorph — /-ing/
Note: This morpheme has no irregularities. (This is meta-irregular.)

(7) Verbs Infinitive [-Ø]
Regular suffixal allomorph — /-i/
Note: This morpheme has a distinct form only in the verb be.

(8) Adjectives Comparative [-ER₁]
Regular suffixal allomorph — /-er/
Note: This morpheme applies only to monosyllabic adjectives and adverbs, bisyllabic ones that end in /-er/ (e.g., heavier, happier), and some bisyllabic ones that end in /-er/ (e.g., shallower, narrower, but not *meller).
Irregular suppletive forms: [good/well + -ER₁] = better
                          [bad + -ER₁] = worse
                          [much + -ER₁] = more

(9) Adjectives Superlative [-EST]
Regular suffixal allomorph — /-est/
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)**

<table>
<thead>
<tr>
<th>Gloss</th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>'table'</td>
<td>astal</td>
<td>astalok</td>
</tr>
<tr>
<td>'worker'</td>
<td>munkaš</td>
<td>munkašok</td>
</tr>
<tr>
<td>'man'</td>
<td>ember</td>
<td>emberek</td>
</tr>
<tr>
<td>'white'</td>
<td>feher</td>
<td>fehe:rek</td>
</tr>
<tr>
<td>'this'</td>
<td>ez</td>
<td>ezek</td>
</tr>
<tr>
<td>'line'</td>
<td>şor</td>
<td>şorok</td>
</tr>
<tr>
<td>'eyeglasses'</td>
<td>semüveg</td>
<td>semüvegek</td>
</tr>
<tr>
<td>'shirt'</td>
<td>iğ</td>
<td>iğek</td>
</tr>
<tr>
<td>'head'</td>
<td>fey</td>
<td>feyek</td>
</tr>
<tr>
<td>'box'</td>
<td>doboz</td>
<td>dobozok</td>
</tr>
<tr>
<td>'drum'</td>
<td>dob</td>
<td>dobok</td>
</tr>
<tr>
<td>'age'</td>
<td>kor</td>
<td>korok</td>
</tr>
<tr>
<td>'coat'</td>
<td>kaba:t</td>
<td>kaba:tok</td>
</tr>
<tr>
<td>'flower'</td>
<td>virag</td>
<td>viragok</td>
</tr>
</tbody>
</table>

**Michoacan Nahuatl (Uto-Aztecan)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[nokali]</td>
<td>'my house'</td>
<td>[mopelo]</td>
</tr>
<tr>
<td>[nokalimes]</td>
<td>'my houses'</td>
<td>[mopelomes]</td>
</tr>
<tr>
<td>[mokali]</td>
<td>'your house'</td>
<td>[ipelo]</td>
</tr>
<tr>
<td>[ikali]</td>
<td>'his house'</td>
<td>[nokwahmili]</td>
</tr>
<tr>
<td>[kali]</td>
<td>'house'</td>
<td>[mokwahmili]</td>
</tr>
<tr>
<td>[kalimes]</td>
<td>'houses'</td>
<td>[ikwahmili]</td>
</tr>
<tr>
<td>[nopelo]</td>
<td>'my dog'</td>
<td>[ikwahmilimes]</td>
</tr>
</tbody>
</table>

What does *ipelo* mean in this language?

How would you say 'his cornfields' in Michoacan?
### Isthmus Zapotec

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. [ñee]</td>
<td>'foot'</td>
<td>11. [kazigitu]</td>
</tr>
<tr>
<td>2. [kañee]</td>
<td>'feet'</td>
<td>12. [kazigidu]</td>
</tr>
<tr>
<td>3. [ñebe]</td>
<td>'his foot'</td>
<td>13. [ziike]</td>
</tr>
<tr>
<td>4. [kañebe]</td>
<td>'his feet'</td>
<td>14. [ziikebe]</td>
</tr>
<tr>
<td>5. [ñeelu?]</td>
<td>'your foot'</td>
<td>15. [kazikelu?]</td>
</tr>
<tr>
<td>6. [kañeetu]</td>
<td>'your (pl.) feet'</td>
<td>16. [diiga]</td>
</tr>
<tr>
<td>7. [kañedu]</td>
<td>'our feet'</td>
<td>17. [kadiagatu]</td>
</tr>
<tr>
<td>8. [kazigi]</td>
<td>'chins'</td>
<td>18. [kadiagadu]</td>
</tr>
<tr>
<td>9. [zigibe]</td>
<td>'his chin'</td>
<td>19. [bisozedu]</td>
</tr>
<tr>
<td>10. [zigilu?]</td>
<td>'your chin'</td>
<td>20. [bisozetu]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21. [kabisozetu]</td>
</tr>
</tbody>
</table>

### Quiché (Mayan)

1. kiŋšikix le ñbr......................‘I read (present tense) the book.’

2. kusikix le ñbr......................‘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. šasikix le ñbr iwuł....................‘You read the book yesterday.’
Sample Quiz

Linguistics 210

Name ___________________________ Sec ______

Samoan (Austronesian)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>manaō</td>
<td>(he) wishes</td>
<td>manaōa</td>
</tr>
<tr>
<td>2.</td>
<td>mana</td>
<td>(he) is old</td>
<td>matuāa</td>
</tr>
<tr>
<td>3.</td>
<td>malosī</td>
<td>(he) is strong</td>
<td>malosī</td>
</tr>
<tr>
<td>4.</td>
<td>punoū</td>
<td>(he) bends</td>
<td>punoū</td>
</tr>
<tr>
<td>5.</td>
<td>savali</td>
<td>(he) travels</td>
<td>savali</td>
</tr>
<tr>
<td>6.</td>
<td>pesē</td>
<td>(he) sings</td>
<td>pesē</td>
</tr>
<tr>
<td>7.</td>
<td>laga</td>
<td>(he) weaves</td>
<td>laga</td>
</tr>
<tr>
<td>8.</td>
<td>atamāʔi</td>
<td>(he) is wise</td>
<td>atamāʔi</td>
</tr>
</tbody>
</table>

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.
Three kinds of "Word" as exemplified in a small portion of the morphological network of the English verbs lie₁ 'tell an untruth' (with its associated nominalization lie 'an untruth') and lie₂ 'recline' (with its associated causative verb lay 'cause to recline'). Some relationships with other lexemes are also shown.
Bayramlaşamadıklarımızdandır.
/bayramlaşamadıklarımızdandır/

‘He is among those with whom we haven’t been able to exchange season’s greetings.’

bayram ‘holiday’

bayramlaş ‘exchange season’s greetings’
   - -la = nominal;
   -y = reciprocal form.

-ama ‘not being able to do’ form of verb.

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

-lar plural

-umuz 1st person plural possessive ending

-dan Ablative case ending, ‘from’

-dir 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 può già considerare semifinalista.

Le squadre sono scese in campo nelle seguenti formazioni:

Paese Sera: Specia; Iattanzi; Montilla; Pironti; Magagnini; Romozzi; Iannetti; Porcu; Seghetti I; Seghetti II; Tetti.

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


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. șrem  ‘autumn’
2. hım  ‘hymn’
3. nım  ‘norm’
4. sízan  ‘season’
5. șámnl  ‘autumnal’
6. hímnl  ‘hymnal’
7. nírmnl  ‘normal’
8. sízñnl  ‘seasonal’

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

**German**

1. tsita:t  ‘selection’
2. bo:t  ‘boat’
3. gra:t  ‘degree’
4. lit:  ‘song’
5. tsita:ta  ‘selections’
6. bo:ta  ‘boats’
7. gra:da  ‘degrees’
8. li:da  ‘songs’

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

**Latin**

<table>
<thead>
<tr>
<th>Nom.</th>
<th>Glos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pleps  ‘commoner’</td>
</tr>
<tr>
<td>2</td>
<td>lapis  ‘stone’</td>
</tr>
<tr>
<td>3</td>
<td>honos  ‘honor’</td>
</tr>
<tr>
<td>4</td>
<td>noks  ‘night’</td>
</tr>
<tr>
<td>5</td>
<td>re:ks  ‘king’</td>
</tr>
<tr>
<td>6</td>
<td>lu:ks  ‘light’</td>
</tr>
<tr>
<td>7</td>
<td>fruks  ‘fruit’</td>
</tr>
<tr>
<td>8</td>
<td>yus:  ‘law’</td>
</tr>
<tr>
<td>9</td>
<td>mi:les  ‘soldier’</td>
</tr>
<tr>
<td>10</td>
<td>homo:  ‘human being’</td>
</tr>
<tr>
<td>Gen.</td>
<td>plebis plebi: plebem</td>
</tr>
<tr>
<td>Dat.</td>
<td>lapidis lapidi: lapidem</td>
</tr>
<tr>
<td>Acc.</td>
<td>honoris honori: honorem</td>
</tr>
<tr>
<td></td>
<td>noktis nokti: noktem</td>
</tr>
<tr>
<td></td>
<td>re:gis re:gi: re:gem</td>
</tr>
<tr>
<td></td>
<td>lu:kis lu:ki: lu:kem</td>
</tr>
<tr>
<td></td>
<td>frugis frugi: frugem</td>
</tr>
<tr>
<td></td>
<td>yurris yuri: yurem</td>
</tr>
<tr>
<td></td>
<td>hominis homi: hominem</td>
</tr>
</tbody>
</table>

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:main canoe 12. nitospwa:kan my pipe
2. niči:main my canoe 13. akimew he counts
3. so:ninya money 14. nitakimen I count
4. niso:ninya 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. nikaapi I will sit

Hanunoo (Austronesian)

1. ?usa 'one' 8. kas?a 'once' 15. ?usahi 'make it one'
2. duwa 'two' 9. kadwa 'twice' 16. duwahe 'make it two'
3. tulu 'three' 10. katlu 'three times' 17. tuluhi 'make it three'
4. ?upat 'four' 11. kap?at 'four times' 18. ?upati 'make it four'
5. lima 'five' 12. kalima 'five times' 19. limahi 'make it five'
6. ?unum 'six' 13. kan?um 'six times' 20. ?unumi 'make it six'
7. pitu 'seven' 14. kapitu 'seven times' 21. pituhi 'make it seven'
## English (Indo-European)

1. Actual English nouns

<table>
<thead>
<tr>
<th>Spelling</th>
<th>Pronunciation</th>
<th>Plural pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>slab</td>
<td>/sæb/</td>
<td>/_</td>
</tr>
<tr>
<td>hash</td>
<td>/hæs/</td>
<td>/_</td>
</tr>
<tr>
<td>tuna</td>
<td>/túna/</td>
<td>/_</td>
</tr>
<tr>
<td>book</td>
<td>/bʊk/</td>
<td>/_</td>
</tr>
<tr>
<td>giraffe</td>
<td>/jɪrəf/</td>
<td>/_</td>
</tr>
<tr>
<td>garage</td>
<td>/ɡəræɡ/</td>
<td>/_</td>
</tr>
<tr>
<td>tree</td>
<td>/tri/</td>
<td>/_</td>
</tr>
<tr>
<td>dog</td>
<td>/dɔɡ/</td>
<td>/_</td>
</tr>
<tr>
<td>mesh</td>
<td>/mɛʃ/</td>
<td>/_</td>
</tr>
<tr>
<td>latch</td>
<td>/lætʃ/</td>
<td>/_</td>
</tr>
<tr>
<td>trace</td>
<td>/tres/</td>
<td>/_</td>
</tr>
<tr>
<td>judge</td>
<td>/dʒʊdʒ/</td>
<td>/_</td>
</tr>
<tr>
<td>store</td>
<td>/stɔr/</td>
<td>/_</td>
</tr>
<tr>
<td>slough</td>
<td>/sloʊ/</td>
<td>/_</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>‘Spelling’</th>
<th>Pronunciation</th>
<th>Plural pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>sab</td>
<td>/sæb/</td>
<td>/_</td>
</tr>
<tr>
<td>fauche</td>
<td>/foʃ/</td>
<td>/_</td>
</tr>
<tr>
<td>eima</td>
<td>/ˈeɪmə/</td>
<td>/_</td>
</tr>
<tr>
<td>shuque</td>
<td>/ʃuːk/</td>
<td>/_</td>
</tr>
<tr>
<td>hafe</td>
<td>/heɪf/</td>
<td>/_</td>
</tr>
<tr>
<td>mauge</td>
<td>/moʊʒ/</td>
<td>/_</td>
</tr>
<tr>
<td>feeny</td>
<td>/ˈfɛni/</td>
<td>/_</td>
</tr>
<tr>
<td>saug</td>
<td>/sɒɡ/</td>
<td>/_</td>
</tr>
<tr>
<td>besh</td>
<td>/bɛʃ/</td>
<td>/_</td>
</tr>
<tr>
<td>gatch</td>
<td>/ɡætʃ/</td>
<td>/_</td>
</tr>
<tr>
<td>hess</td>
<td>/hɛs/</td>
<td>/_</td>
</tr>
<tr>
<td>borge</td>
<td>/bɔrɡ/</td>
<td>/_</td>
</tr>
<tr>
<td>sclear</td>
<td>/sklʊr/</td>
<td>/_</td>
</tr>
<tr>
<td>boux</td>
<td>/bʊ/</td>
<td>/_</td>
</tr>
</tbody>
</table>

What is the rule for forming the English noun plural?
### Japanese

<table>
<thead>
<tr>
<th>Verb Stems</th>
<th>Gerund forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. tabe-</td>
<td>tabe-te eating</td>
</tr>
<tr>
<td>2. yob-</td>
<td>yon-de calling</td>
</tr>
<tr>
<td>3. shin-</td>
<td>shin-de dying</td>
</tr>
<tr>
<td>4. kak-</td>
<td>kaite writing</td>
</tr>
<tr>
<td>5. yom-</td>
<td>yon-de reading</td>
</tr>
<tr>
<td>6. mi-</td>
<td>mite seeing</td>
</tr>
<tr>
<td>7. asob-</td>
<td>ason-de playing</td>
</tr>
<tr>
<td>8. tob-</td>
<td>ton-de flying</td>
</tr>
<tr>
<td>9. aruk-</td>
<td>aru-te walking</td>
</tr>
<tr>
<td>10. nom-</td>
<td>non-de drinking</td>
</tr>
<tr>
<td>11. aketa</td>
<td>opened</td>
</tr>
<tr>
<td>12. akarareta</td>
<td>was opened</td>
</tr>
<tr>
<td>13. akesasete</td>
<td>caused to open</td>
</tr>
<tr>
<td>14. akesaserareta</td>
<td>was caused to open</td>
</tr>
<tr>
<td>15. tabeta</td>
<td>ate</td>
</tr>
<tr>
<td>16. taberareta</td>
<td>was eaten</td>
</tr>
<tr>
<td>17. tabesasete</td>
<td>caused to eat</td>
</tr>
<tr>
<td>18. tabesaserareta</td>
<td>was caused to eat</td>
</tr>
<tr>
<td>19. yonda</td>
<td>read [red]</td>
</tr>
<tr>
<td>20. yomareta</td>
<td>was read</td>
</tr>
<tr>
<td>21. yomaseta</td>
<td>caused to read</td>
</tr>
<tr>
<td>22. yomasaserareta</td>
<td>was caused to read</td>
</tr>
<tr>
<td>23. tonda</td>
<td>flew</td>
</tr>
<tr>
<td>24. tobareta</td>
<td>was flown</td>
</tr>
<tr>
<td>25. tobasete</td>
<td>caused to fly</td>
</tr>
<tr>
<td>26. tobaserareta</td>
<td>was caused to fly</td>
</tr>
<tr>
<td>27. ataeta</td>
<td>awarded</td>
</tr>
<tr>
<td>28. ataerareta</td>
<td>was awarded</td>
</tr>
<tr>
<td>29. ataesasete</td>
<td>caused to award</td>
</tr>
<tr>
<td>30. ataesaserareta</td>
<td>was caused to award</td>
</tr>
<tr>
<td>31. eranda</td>
<td>chose</td>
</tr>
<tr>
<td>32. erabareta</td>
<td>was chosen</td>
</tr>
<tr>
<td>33. erabasete</td>
<td>caused to choose</td>
</tr>
<tr>
<td>34. erabaserareta</td>
<td>was caused to choose</td>
</tr>
</tbody>
</table>
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).

<table>
<thead>
<tr>
<th>Past</th>
<th>Passive</th>
<th>Neuter</th>
<th>Applied</th>
<th>Reciprocal</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>čita</td>
<td>čitwa</td>
<td>čitika</td>
<td>čitila</td>
<td>čitana</td>
<td>'do'</td>
</tr>
<tr>
<td>tula</td>
<td>tulwa</td>
<td>tulika</td>
<td>tulila</td>
<td>tulana</td>
<td>'dig'</td>
</tr>
<tr>
<td>četa</td>
<td>četwa</td>
<td>četeka</td>
<td>četela</td>
<td>četana</td>
<td>'spy'</td>
</tr>
<tr>
<td>sogka</td>
<td>sogkwa</td>
<td>sogkeka</td>
<td>sogkela</td>
<td>sogkana</td>
<td>'pay tax'</td>
</tr>
<tr>
<td>fisca</td>
<td>fiswa</td>
<td>fišika</td>
<td>fišila</td>
<td>fisana</td>
<td>'hide'</td>
</tr>
<tr>
<td>kosa</td>
<td>koswa</td>
<td>koseka</td>
<td>kosela</td>
<td>kosana</td>
<td>'be strong'</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>familiaris</th>
<th>regularis</th>
<th>minimalis</th>
<th>principalis</th>
</tr>
</thead>
<tbody>
<tr>
<td>animalis</td>
<td>mortalis</td>
<td>lunaris</td>
<td>floralis</td>
</tr>
<tr>
<td>liberalis</td>
<td>coronalis</td>
<td>hospitalis</td>
<td>militaris</td>
</tr>
<tr>
<td>capitalis</td>
<td>consularis</td>
<td>navalis</td>
<td>lateralis</td>
</tr>
<tr>
<td>pluralis</td>
<td>regalis</td>
<td>peculiaris</td>
<td>popularis</td>
</tr>
<tr>
<td>singularis</td>
<td>virginalis</td>
<td>dorsalis</td>
<td>corporalis</td>
</tr>
</tbody>
</table>

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/

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 an open class?: http://www.sil.org/linguistics/GlossaryOfLinguisticTerms/WhatIsAnOpenClass.htm

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.

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.

6. The term ‘adverb’ 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’ (?a:k*čila), 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

   "The old man is walking."
   "The old woman is walking."
   "The old man walked."
4. ?u?ibas?atastubs
   "The man walked."
5. tu?ibas?acastaday
   "The woman will walk."
6. ?atulawil?atastubs
   "The man ran."
7. tu?lib?acastaday?utuk"acilas... "The woman will sing tomorrow."
   "The man walked fast."
   "The old man will sing well."
    "The man runs [habitually]."
    "The man runs fast [habitually]."
    "The man is singing now."
    "The woman sang."
    "The old woman is making baskets."
    "The man made baskets."
    "The woman makes baskets [habitually]."
    "The man is walking fast."
18. ?ulib?i.
    "Sing! [plural subject]"
19. ?ulawil.
    "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 /lu?k/?
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. sájatstůubš. "The man is tall."
2. míma?tastúubš. "The man is small."
3. míma?dálq"abáz. "The dog is small."
4. ?asàtcaståday. "The woman is sick."
5. ?as?itutalú. "The old man is asleep."
6. qájatstůubš. "The man is (a) Skagit."
7. qqájatstůubš. "The man speaks Skagit."
8. lábsájatstůubš. "The old man is very tall."
9. hámubšcaståday. "The woman is pretty."
10. ?asqátcalú. "The old woman is awake."
12. stübilitstůubš. "The man is strong."
13. tustübilitstůubš. "The man was once strong."
14. ?astákocú. "The water is cold."
15. híktačabid?ac. "The fir tree is tall."
16. tu?míma?dálqabid?ac. "The fir tree was small."
17. híkta?spá?c. "The bear is big."
19. hám?tatsyiqib?acståday. "The woman used to make good baskets."
21. tu?as?itcaståday. "The woman was asleep."
22. tu?alcúúba?talstúubš. "The man was walking."
23. tu?asjú?itäläças. "The child will be happy."
27. ?alcúqalabakú. "It's starting to rain."
28. bé?alcúqalabakú. "It's starting to rain again."
29. duqátalbxcaståday. "The woman is (a) Snoqualmie."
30. ddúcátalbxcaståday. "The woman speaks Snoqualmie."

THERE ARE 2 TYPHOGRAPHIES IN THE DATA. FIND THEM.

26
Maori (Austronesian)

<table>
<thead>
<tr>
<th>Active</th>
<th>Passive</th>
<th>Gerund</th>
<th>Gloss</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>afi</td>
<td>afitia</td>
<td>afitaga</td>
<td>embrace</td>
<td></td>
</tr>
<tr>
<td>hopu</td>
<td>hopukia</td>
<td>hopukana</td>
<td>catch</td>
<td></td>
</tr>
<tr>
<td>aru</td>
<td>arumia</td>
<td>arumana</td>
<td>follow</td>
<td></td>
</tr>
<tr>
<td>paa</td>
<td>paajia</td>
<td>paana</td>
<td>shut</td>
<td></td>
</tr>
<tr>
<td>mau</td>
<td>mauria</td>
<td>maurana</td>
<td>carry</td>
<td></td>
</tr>
<tr>
<td>wero</td>
<td>werohia</td>
<td>werohana</td>
<td>stab</td>
<td></td>
</tr>
</tbody>
</table>

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  patuaga  strike  ______
   kite  kitea  kitea  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. kwikas ................................................... 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. tico:kayah .......................................... We were crying.
14. čo:ka ................................................... He cries.
15. kočini ................................................... He is sleeping.
16. ančo:kayah ........................................ You (pl) were crying.
17. tico:kanih ........................................... We are crying.
18. kwikah ................................................ They sing.
19. tıkwikani ........................................ 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-Aztecans)

| 1. kalli | house       | 17. kakxi | sandal   |
| 2. a-x | water       | 18. a-to-lli | gruel    |
| 3. te-kwxi | lord     | 19. ekxi  | blood    |
| 4. te-shxi | brother-in-law | 20. koyo-x | coyote   |
| 5. ta-kiye | father    | 21. tochxi | rabbit   |
| 6. teo-x | god        | 22. oki-chxi | man      |
| 7. cho-xi   | flower    | 23. ik-xi | foot     |
| 8. ilwikax | sky, heaven | 24. akax | atlatl   |
| 9. kuawxi  | eagle     | 25. o-xi | road     |
| 10. ko-lli | grandfather | 26. okxi | wine, pulque |
| 11. to-to-x | bird     | 27. ko-a-x | snake   |
| 12. pilli   | son, boy  | 28. xa-kax | person  |
| 13. masa-x  | deer      | 29. siwa-x | woman   |
| 14. na-nxi  | mother    | 30. tepe-x | mountain |
| 15. a-kalli | canoe     | 31. picox | pig      |
| 16. kone-x  | child     | 32. ti-six | 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. [\lambda], is a voiceless lateral affricate.

a complex consonant composed of

a voiceless dental stop [t], releasing into

a voiceless lateral fricative [t̪], i.e. [t̪̆]
Pocomché (Mayan)

Below is a list of inflected present tense verb forms in Pocomché; 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 Pocomché.

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

<table>
<thead>
<tr>
<th>'help'</th>
<th>'see'</th>
<th>'help'</th>
<th>'see'</th>
</tr>
</thead>
<tbody>
<tr>
<td>I—you</td>
<td>tinitow</td>
<td>I—him</td>
<td>initow</td>
</tr>
<tr>
<td>I—they</td>
<td>kinitow</td>
<td>You—me</td>
<td>kinatow</td>
</tr>
<tr>
<td>You—him</td>
<td>inarow</td>
<td>You—us</td>
<td>qoxatow</td>
</tr>
<tr>
<td>You—they</td>
<td>katow</td>
<td>He—me</td>
<td>kiritow</td>
</tr>
<tr>
<td>He—you</td>
<td>tinitow</td>
<td>He—him</td>
<td>iritow</td>
</tr>
<tr>
<td>He—us</td>
<td>qoxritow</td>
<td>He—them</td>
<td>kiritow</td>
</tr>
<tr>
<td>We—you</td>
<td>tiqatow</td>
<td>We—him</td>
<td>inqatow</td>
</tr>
<tr>
<td>We—they</td>
<td>kiqatow</td>
<td>They—me</td>
<td>kinkitow</td>
</tr>
<tr>
<td>They—you</td>
<td>tikitow</td>
<td>They—him</td>
<td>inkitow</td>
</tr>
<tr>
<td>They—us</td>
<td>qoxkitow</td>
<td>They—they</td>
<td>kikitow</td>
</tr>
</tbody>
</table>

Hint 1: Like English, Pocomché 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.
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>nabor-</td>
<td>naborsčik</td>
</tr>
<tr>
<td>kamen-</td>
<td>kamenščik</td>
</tr>
<tr>
<td>časov-</td>
<td>časovščik</td>
</tr>
<tr>
<td>ljot-</td>
<td>ljotčik</td>
</tr>
<tr>
<td>perips-</td>
<td>peripisčik</td>
</tr>
<tr>
<td>perevod-</td>
<td>perevodčik</td>
</tr>
<tr>
<td>boz-</td>
<td>božčik</td>
</tr>
<tr>
<td>atom-</td>
<td>atomščik</td>
</tr>
<tr>
<td>pulemjet-</td>
<td>pulemjetščik</td>
</tr>
<tr>
<td>mebel-</td>
<td>mebelščik</td>
</tr>
<tr>
<td>beton-</td>
<td>betonsčik</td>
</tr>
<tr>
<td>lom-</td>
<td>lomščik</td>
</tr>
</tbody>
</table>

Russian  
(Indo-European)
<table>
<thead>
<tr>
<th>Infinitive</th>
<th>Present Indicative</th>
<th>Present Subjunctive</th>
<th>Imperfective Indicative</th>
<th>Past Participle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ablár</td>
<td>‘to speak’</td>
<td>ábla</td>
<td>áble</td>
<td>abládo</td>
</tr>
<tr>
<td>2. sitár</td>
<td>‘to cite’</td>
<td>sīta</td>
<td>sīte</td>
<td>sitádo</td>
</tr>
<tr>
<td>3. dudár</td>
<td>‘to doubt’</td>
<td>dūda</td>
<td>dúde</td>
<td>dudádo</td>
</tr>
<tr>
<td>4. kemár</td>
<td>‘to burn’</td>
<td>kéma</td>
<td>kéme</td>
<td>kemádo</td>
</tr>
<tr>
<td>5. pensár</td>
<td>‘to think’</td>
<td>piénsa</td>
<td>piénse</td>
<td>pensádo</td>
</tr>
<tr>
<td>6. řobár</td>
<td>‘to steal’</td>
<td>řóba</td>
<td>řóbe</td>
<td>řobádo</td>
</tr>
<tr>
<td>7. kostár</td>
<td>‘to cost’</td>
<td>kuésta</td>
<td>kuéste</td>
<td>kostádo</td>
</tr>
<tr>
<td>8. bařéře</td>
<td>‘to sweep’</td>
<td>baře</td>
<td>bárfa</td>
<td>bařídoo</td>
</tr>
<tr>
<td>9. bendér</td>
<td>‘to sell’</td>
<td>bénede</td>
<td>benda</td>
<td>bendídoo</td>
</tr>
<tr>
<td>10. perdér</td>
<td>‘to lose’</td>
<td>piérdde</td>
<td>piérdia</td>
<td>perdídoo</td>
</tr>
<tr>
<td>11. komér</td>
<td>‘to eat’</td>
<td>kóme</td>
<td>kómia</td>
<td>komídoo</td>
</tr>
<tr>
<td>12. mobér</td>
<td>‘to move’</td>
<td>muébe</td>
<td>muéba</td>
<td>mobídoo</td>
</tr>
<tr>
<td>13. gañířr</td>
<td>‘to yelp’</td>
<td>gáñe</td>
<td>gañía</td>
<td>gañídoo</td>
</tr>
<tr>
<td>14. suxeríř</td>
<td>‘to suggest’</td>
<td>suxiére</td>
<td>suxiéra</td>
<td>suxerídoo</td>
</tr>
<tr>
<td>15. sentířr</td>
<td>‘to feel’</td>
<td>siénte</td>
<td>siénta</td>
<td>sentídoo</td>
</tr>
<tr>
<td>16. pedířr</td>
<td>‘to ask for’</td>
<td>píde</td>
<td>pída</td>
<td>pedídoo</td>
</tr>
<tr>
<td>17. dormířr</td>
<td>‘to sleep’</td>
<td>duérme</td>
<td>duérma</td>
<td>dormídoo</td>
</tr>
<tr>
<td>18. bruñířr</td>
<td>‘to burnish’</td>
<td>bruñe</td>
<td>bruñía</td>
<td>bruñídoo</td>
</tr>
<tr>
<td>19. sexířr</td>
<td>‘to follow’</td>
<td>sīxe</td>
<td>sīga</td>
<td>sexídoo</td>
</tr>
</tbody>
</table>
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. utaambusu  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. mto..............................'child'
11. mkono..........................'arm'
12. mti..............................'tree'
13. kiti..............................'branch/chair'
14. urefu...........................'length'
15. vikapu.........................'baskets'
16. kitabu.........................'book'
17. mți..............................'person'
18. mčuŋwa.........................'orange tree'
19. mičuŋwa.........................'orange trees'
20. miaka...........................'years'
21. umoja...........................'unity'
22. visu..............................'knives'
23. watoto.........................'children'
24. wa.u............................'people'
25. kisu..............................'knife'
26. vid..............................'branches/chairs'
27. miguu............................'legs'
28. mguu...........................'leg'
29. mwaka.........................'year'
30. kibanda.........................'hut'
31. mitende.........................'date palms'
32. uzee...........................'old age'
33. vitabu.........................'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. wa ana.........................'sons/daughters'
44. mwali mu.........................'teacher'
45. waali mu.........................'teachers'
46. mizee.........................'old things'
47. kuenda.........................'to go'
48. mwaha.........................'stonemason'
49. kuaha.........................'to build in stone'
50. jiino.........................'tooth'
51. maino.........................'teeth'
52. mawe...........................'stones'
53. jiwe.........................'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:

Mtii umaŋguka..........................'A (or the) tree has fallen down.'
Mtii imaŋguka..........................'Some (or the) trees have fallen down.'
Kitoto kimečafuka..........................'The infant is untidy.'
Vitoto vimečafuka..........................'The infants are untidy.'
Mwaka waŋha..........................'The year is over.' (Lit: 'builds in stone')†
Miakajaŋha..........................'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'
Mtii mvivu..........................'A lazy person'
Watu wawili..........................'Two people'
Mtii mzuri..........................'A (or the) fine tree'
Mtii mitatu..........................'Three trees'
Jiŋo jirefu..........................'A (or the) long tooth'
Maino marefu..........................'Long teeth'
Kitabu kimajo kitainiñoŋa..........................'One book will be enough.'
Visu vitatu vinatoŋa..........................'Three knives are enough.'

†Hint: Assume -aŋha to be the stem meaning 'to be over.'
Tagalog (Austronesian)

1. sumalat  write!  16. ?umaral  teach!
2. sumalat  wrote  17. ?umaral  taught
3. susulat  will write  18. ?a?aral  will teach
4. sumusulat  is writing  19. ?uma?aral  is teaching
5. sulatin  be written!  20. ?aralin  be taught!
6. sinulat  was written  21. ?inaral  was taught
7. susulatin  will be written  22. ?a?aralin  will be taught
8. sinusulat  is being written  23. ?ina?aral  is being taught
9. bahanap  will look for  24. ?unibig  love!
10. hanapin  be sought!  25. ?unibig  loved
11. hinahanap  is being sought  26. ?umi?ibig  is loving
12. hanap  was sought  27. ?i?ibig  will love
13. bumabasa  is reading  28. ginawa?  was done
14. bumasag  broke  29. lamapit  approach!
15. dumalit  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 attached to the root:

Supply the forms you would expect for the following glosses:

<table>
<thead>
<tr>
<th>English</th>
<th>Tagalog</th>
</tr>
</thead>
<tbody>
<tr>
<td>call!</td>
<td></td>
</tr>
<tr>
<td>is calling</td>
<td>9umaral</td>
</tr>
<tr>
<td>approached</td>
<td></td>
</tr>
<tr>
<td>will arrive</td>
<td></td>
</tr>
<tr>
<td>will be sought</td>
<td></td>
</tr>
<tr>
<td>is being called</td>
<td></td>
</tr>
<tr>
<td>be done!</td>
<td></td>
</tr>
<tr>
<td>was read</td>
<td></td>
</tr>
</tbody>
</table>
Taiwanese (Sino-Tibetan)
[Note: phonemic tone is not indicated]

<table>
<thead>
<tr>
<th></th>
<th>‘One ...’</th>
<th>‘Two ...’</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>‘man’ ..............................lag.............................naŋ e laŋ</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>‘book’ ..............................cu...............................naŋ e cu</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>‘dog’ ..............................kau...............................naŋ cia kau</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>‘cat’ ..............................niau..............................naŋ cia niau</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>‘pencil’ ............................en pit............................naŋ ki eg pit</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>‘arm’ ...............................ciu...............................naŋ ki c’iu</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>‘finger’ ............................c’ig t’ao a.....................naŋ ki ci g t’ao a</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>‘pen’ ...............................pit...............................naŋ ki pit</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>‘belt’ ...............................k’o tua............................naŋ tiao k’o tua</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>‘wire’ ...............................so a...............................naŋ tiao so a</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>‘tie’ ...............................nia tua............................naŋ tiao nia tua</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>‘path’ ...............................lo...............................naŋ tiao lo</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>‘stone’ ..............................c’io t’au........................naŋ tiap c’io t’au</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>‘star’ ...............................c’i...............................naŋ tiap c’i</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>‘egg’ ...............................naŋ...............................naŋ tiap naŋ</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>‘house’ ..............................ciu...............................naŋ kieg c’u</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>‘library’ ............................to su kuang........................naŋ kieg to su kuang</td>
<td></td>
</tr>
</tbody>
</table>
Turkish (Altaic)

1. görüdü............................He saw.
2. görüldü............................He was seen.
3. görülmedi............................He was not seen.
4. görülüyordu............................He was seeing.
5. görünmedi............................Didn't he see?
6. görünmüyoruz............................We're not being seen.
7. görünmeyekmi............................Won't he see?
8. görüyor gun............................I was going to see.
9. görerek............................They will see.
10. görünmüşü............................He has seen.
11. görünmemişti............................He has not seen.
12. açtı............................He opened it.
13. açmışlardı............................They have opened it.
14. açajaklar............................They will open it.
15. açacakmışım............................I will have opened it.
16. açtım............................Did he open it?
17. açmalıydim............................I should've opened it.
18. açıyor muyum............................Is he opening it?
19. açmadım............................I did not open it.
20. açmadımi............................Didn't he reach it?
21. yetti............................He reached it.
22. yetmeliydim............................I should have reached it.
23. yetmekmiyz............................Will we reach it?
24. yetmemeli............................He should not reach it.
25. yetmişti............................He has reached it.
26. yetiyoruz............................We are reaching it.
27. kirdi............................He broke it.
28. kiriyorum............................I am breaking it.
29. kirilmişti............................It has been broken.
30. kirmayabajmıym............................Won't I break it?
31. kirmayacakmı............................Won't it be broken?
32. kirmamalıyız............................We should not break it.
33. kiraajktım............................I was going to break it.
34. yaziyorlar............................They are writing.
35. yazmakmısım............................I should have written.
36. yazilmamıştı............................It has not been written.
37. yazakmı............................Will he write?
38. yazakmiyz............................Will we write?
39. yazmayordu............................He was not writing.
40. yazakmişız............................We will have written.

There are five verb roots in this data: gör, aç, yet, kir, 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., describe their order of occurrence).

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

Note: Ignore contractions in the glosses — they're used only to save space.
1. adama ‘to the man’
2. adamlardan ‘from the men’
3. baş ‘head’
4. başlar ‘heads’
5. başlarımız ‘our heads’
6. başta ‘in the head’
7. başında ‘in my head’
8. çölde ‘in the desert’
9. çöller ‘deserts’
10. dişim ‘my tooth’
11. dişlerde ‘in the teeth’
12. dişte ‘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. gönülleminiz ‘our hearts’
31. süt ‘milk’
32. görülüm ‘my heart’
33. gözde ‘in the eye’
34. gözlerim ‘my eyes’
35. gözleriniz ‘your eyes’
36. gözüm ‘my eye’
37. gürül ‘haughty’
38. gürün ‘your pride’
39. günler ‘days’
40. günlü ‘daily’
41. gülüm ‘my rose’
42. gülün ‘your rose’
43. gülер ‘roses’
44. kadınlar ‘to the women’
45. seste ‘in the voice’
46. kirli el ‘dirty hand’
47. kızlarımız ‘my girls’
48. kızım ‘my girl’
49. kollarımız ‘our arms’
50. kolum ‘my arm’
51. kollarından ‘from your arms’
52. kuşlar ‘birds’
53. kuşlarım ‘my birds’
54. kuşum ‘my bird’
55. pençerede ‘in the window’
56. pulum ‘my postage stamp’
57. pullarım ‘my postage stamps’
58. sesim ‘my voice’
59. sesleriniz ‘your voices’
60. süt ‘to the milk’

1
Turkish (Altaic)

61. sütte 'in milk'
62. sütten 'from the milk'
63. sütüm 'my milk'
64. sütünüz 'your milk'
65. yaş 'age'
66. yaşım 'my age'
67. yedi adam 'seven men'
68. yedi kuş '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. süüt 'his milk'
76. yaşı 'his age'
77. koju 'his arm'
78. çojukları 'his children'
79. kitap 'book'
80. yüksek sesli adam 'man with a loud voice'
81. kitabım 'my book'
82. ağaclar 'trees'
83. ağaç 'your tree'
84. kitaplar 'books'
85. çoju 'his child'
86. çojuum 'my child'
87. kitaba 'to the book'
88. kitapta 'in the book'
89. kitapta 'from the book'
90. çoju 'to the child'
91. çojuktan 'from the child'
92. aaja 'to the tree'
93. ağaça 'in the tree'
94. ağaç 'tree'
95. köpekler 'dogs'
96. köpei 'his dog'
97. çoju 'child'
98. başlarıniz 'your heads'
99. kuşların 'your birds'
100. yedi pençereli 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?
Greek Nouns 2

1) gōzū 'his eye'  
2) gōzlerim 'my eyes'  
3) gōzündē 'in your eye'  
4) gōnulümde 'in my heart'  
5) kitabınız 'your[pl] book'  
6) dişim 'my tooth'  
7) dişlerim 'my teeth'  
8) adamları 'his men'  
9) başlarımız '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) kuşlarım 'my birds'  
17) kuşu 'his bird'  
18) kadını 'his woman'  
19) kadınların 'your women'  
20) güllerim 'my roses'

Given the following noun roots:

a) ses 'voice'  
e) zīl 'bell'  
b) yaş 'age'  
f) kīz 'girl'  
c) gün 'day'  
g) pul 'stamp'  
d) kol 'arm'  
h) ŋöl '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_i\}
Allomorphs: /-ɔz/, /-z/, /-/s/

Conditioning environments
\{-Z_i\} → /-ɔz/ after sibilants *
\{-Z_i\} → /-/s/ after v1 segments
\{-Z_i\} → /-/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 /-ɔz/ form resulting
    from an English rule of epenthesis that
    inserts a /-ɔ/- to separate the final sibilant
    from the suffix (which also contains a
    sibilant)

Since /a/ 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: [pʰ], [p̃], [p]

Conditioning environments
/p/ → [pʰ] / # V
/p/ → [p̃] 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., /t̪/, /c̪/, and /k/ also have aspirated
allophones in the same environments).
# CONSONANT CHART

<table>
<thead>
<tr>
<th>LabioDental</th>
<th>Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Uvular</th>
<th>Glottal</th>
<th>Pharyngeal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilabial</td>
<td>IntDental</td>
<td>Retroflex</td>
<td></td>
<td></td>
<td></td>
<td>Pharyngeal</td>
</tr>
<tr>
<td>Nasals</td>
<td>m (m̩)</td>
<td>n</td>
<td>ɲ [n̩]</td>
<td>ɲ</td>
<td>(N)</td>
<td></td>
</tr>
<tr>
<td>Plain Stops</td>
<td>p/b</td>
<td>t/d</td>
<td>t̪/ʈ̪</td>
<td>k̬/g̬</td>
<td>q[k̝]/g̝</td>
<td></td>
</tr>
<tr>
<td>(Implosives)</td>
<td>ɓ</td>
<td>ɗ̬</td>
<td>Ɂ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ejectives</td>
<td>ɓ̬</td>
<td>ʈ̣̬</td>
<td>Ɂ̣̬</td>
<td>ḳ̬̬</td>
<td>Ɂ̣̬</td>
<td></td>
</tr>
<tr>
<td>Fricatives</td>
<td>φ/β</td>
<td>r/Ɇ̬̬</td>
<td>Ɇ̬̬</td>
<td>ʃ/ʃ̪</td>
<td>j̜/ʒ̡̪/ʒ̪̊</td>
<td>x̢̬̬</td>
</tr>
<tr>
<td>Affricates</td>
<td>t̡̼̬̪̬/d̡̼̬̪̬ [c̢̬̬/j̢̬̬]</td>
<td>t̡̼̬̪̬/d̡̼̬̪̬ [c̢̬̬/j̢̬̬]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral Obstruents</td>
<td>ʃ̬̝̪̬/Ɇ̬̝̪̬ [x̢̬̝̪̬/Ɇ̬̝̪̬]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral Resonants</td>
<td>l</td>
<td>l̬</td>
<td>x̢̬̬ [l̢̬̬]</td>
<td>Ɂ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semivowels</td>
<td>w</td>
<td>j̢̬̬ [ʒ̢̬̬]</td>
<td>y̢̬ hara</td>
<td>w</td>
<td>h</td>
<td></td>
</tr>
<tr>
<td>Trills</td>
<td>r̬</td>
<td>ā̬̬</td>
<td></td>
<td>ɾ̬</td>
<td>ɾ̬</td>
<td></td>
</tr>
<tr>
<td>Tap or Flap</td>
<td>r̬ [ɾ̬]</td>
<td>l̬ [ɾ̬]</td>
<td></td>
<td>ɾ̬</td>
<td>l̬</td>
<td></td>
</tr>
</tbody>
</table>

\*k, kɿ, tɿ [-t, c], kʰ, t̡̼̬̪̬ [-t̡̼̬̪̬], Ɇ̬̬ [-t̡̼̬̪̬], ʃ̬̝̪̬ [-ʃ̬̝̪̬], k̬̬, ɲ, ɲ, Ɂ, Ɂ, ɾ; Ɂ̣̬ = flat pal fric

# VOWEL CHART

<table>
<thead>
<tr>
<th>Front</th>
<th>Central</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>ɪ̝̝̝̝</td>
<td>u</td>
</tr>
<tr>
<td>ɪ̝̝̝̝</td>
<td>[i̝̝̝̝]</td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>ɤ̝̝̝̝</td>
<td>o</td>
</tr>
<tr>
<td>æ̝̝̝̝</td>
<td>a</td>
<td>ɑ̝̝̝̝</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Front</th>
<th>Central</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>y̝̝̝̝̝</td>
<td>ʉ̝̝̝̝</td>
</tr>
<tr>
<td>Lax</td>
<td>ɤ̝̝̝̝̝</td>
<td>o̝̝̝̝̝</td>
</tr>
<tr>
<td>Mid</td>
<td>ɒ̝̝̝̝̝</td>
<td>ə̝̝̝̝̝</td>
</tr>
<tr>
<td>Lax</td>
<td>æ̝̝̝̝</td>
<td>ɔ̝̝̝̝̝</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unrounded</th>
<th>Rounded</th>
</tr>
</thead>
</table>
| a̝̝̝̝̝̝̝ | [a̝̝̝̝̝̝̝]| a̝̝̝̝̝̝̝ | [a̝̝̝̝̝̝̝]
| o̝̝̝̝̝̝̝ | [o̝̝̝̝̝̝̝]| o̝̝̝̝̝̝̝ | [o̝̝̝̝̝̝̝]
| ɔ̝̝̝̝̝̝̝ | [ɔ̝̝̝̝̝̝̝]| ɔ̝̝̝̝̝̝̝ | [ɔ̝̝̝̝̝̝̝]
| y̝̝̝̝̝̝̝ | [y̝̝̝̝̝̝̝]| y̝̝̝̝̝̝̝ | [y̝̝̝̝̝̝̝]|
| ɭ̝̝̝̝̝̝̝ | [ɭ̝̝̝̝̝̝̝]| ɭ̝̝̝̝̝̝̝ | [ɭ̝̝̝̝̝̝̝]|
| i̝̝̝̝̝̝̝ | [i̝̝̝̝̝̝̝]| i̝̝̝̝̝̝̝ | [i̝̝̝̝̝̝̝]|

42
THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

**CONSONANTS (PULMONIC)**

<table>
<thead>
<tr>
<th>Plosive</th>
<th>Bilabial</th>
<th>Labiodental</th>
<th>Dental</th>
<th>Alveolar</th>
<th>Post-alveolar</th>
<th>Retruded</th>
<th>Palatal</th>
<th>Velar</th>
<th>U-velar</th>
<th>Pharyngeal</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plosive</td>
<td>p b</td>
<td>t d</td>
<td>t d</td>
<td>c j</td>
<td>k g</td>
<td>q g</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal</td>
<td>m m</td>
<td>n n</td>
<td>n n</td>
<td>n n</td>
<td>n n</td>
<td>n n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trill</td>
<td>B</td>
<td>r r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trip or Flag</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fricative</td>
<td>φ β f v</td>
<td>θ δ s z</td>
<td>ʃ ʒ ɹ ς j i x y x r f h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral fricative</td>
<td></td>
<td>l l</td>
<td>l l</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**CONSONANTS (NON-PULMONIC)**

<table>
<thead>
<tr>
<th>Clicks</th>
<th>Voiced implosives</th>
<th>Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilabial</td>
<td>b Bilabial</td>
<td>as in</td>
</tr>
<tr>
<td>Dental</td>
<td>d Dental/alveolar</td>
<td>p' Bilabial</td>
</tr>
<tr>
<td>Palatal</td>
<td>s Palatal</td>
<td>ʃ' Palatal</td>
</tr>
<tr>
<td>Alveolar lateral</td>
<td>c Uvular</td>
<td>s' Alveolar fricative</td>
</tr>
</tbody>
</table>

**VOWELS**

<table>
<thead>
<tr>
<th>Front</th>
<th>Central</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close</td>
<td>i y i a</td>
<td>u w u</td>
</tr>
<tr>
<td>Close-mid</td>
<td>e ø e ø</td>
<td>ϕ ø ϕ</td>
</tr>
<tr>
<td>Open-mid</td>
<td>æ ø æ æ</td>
<td>æ ø æ</td>
</tr>
<tr>
<td>Open</td>
<td>æ æ æ æ</td>
<td>æ æ æ</td>
</tr>
</tbody>
</table>

**SUPRASEGMENTALS**

<table>
<thead>
<tr>
<th>Primary stress</th>
<th>Secondary stress</th>
<th>Tones &amp; Word Accents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long e</td>
<td>High e</td>
<td>Extra-High e</td>
</tr>
<tr>
<td>Mar-long e</td>
<td>Mid e</td>
<td>Extra-Mid e</td>
</tr>
<tr>
<td>Extra-short e</td>
<td>Low e</td>
<td>Extra-Low e</td>
</tr>
<tr>
<td>Syllable break</td>
<td>Rising e</td>
<td>Low Rising e</td>
</tr>
<tr>
<td>Major (acoustic)</td>
<td></td>
<td>Rising-Falling e</td>
</tr>
<tr>
<td>Linking (absence of a break)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DIACRITICS**

Diacritics may be placed above a symbol with a desiderate, e.g. ʃ.

<table>
<thead>
<tr>
<th>Voiced h</th>
<th>Breathy voiced b a</th>
<th>Dorsal t d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiced t h</td>
<td>Breathy voiced b a</td>
<td>Apical t d</td>
</tr>
<tr>
<td>Voiced s</td>
<td>Breathy voiced b a</td>
<td>Laminal t d</td>
</tr>
<tr>
<td>Voiced t</td>
<td>Breathy voiced b a</td>
<td>Labial t d</td>
</tr>
<tr>
<td>Voiced s</td>
<td>Breathy voiced b a</td>
<td>Nasal t d</td>
</tr>
<tr>
<td>Voiced i</td>
<td>Breathy voiced b a</td>
<td>No nasal release t d</td>
</tr>
<tr>
<td>Voiced e</td>
<td>Breathy voiced b a</td>
<td>Centralized e</td>
</tr>
<tr>
<td>Voiced o</td>
<td>Breathy voiced b a</td>
<td>Vocalized or pharyngealized t</td>
</tr>
<tr>
<td>Voiced ē</td>
<td>Breathy voiced b a</td>
<td>Kairosorialized ē</td>
</tr>
<tr>
<td>Voiced ē</td>
<td>Breathy voiced b a</td>
<td>Raised ē ( = voiced alveolar fricative)</td>
</tr>
<tr>
<td>Voiced j</td>
<td>Breathy voiced b a</td>
<td>Lowrounded ē ( = voiced bilabial approximation)</td>
</tr>
<tr>
<td>Voiced j</td>
<td>Breathy voiced b a</td>
<td>Advanced Tongue Root j</td>
</tr>
<tr>
<td>Voiced ē</td>
<td>Breathy voiced b a</td>
<td>Retracted Tongue Root ē</td>
</tr>
</tbody>
</table>
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

De last m.i.

...as members will now, this is the latest number of the m.i. in its present form. As described it was published in the first issue in 1889, but previously, from 1886, it was issued as "Le Maitre Fonetik." In 1899, an association had 321 members in 20 countries. In Madagascar, Kimmig from the University of Paris, "demonstrating" its texts, gave him over 800 members in 30 countries. In Great Britain, he gave the International Phonetic Society a great boost.

Now let us look at the structure of pronunciation. Journal in phonetic, as a fact, came in 1971. In 1971, the first publication was made by the Association of 300 members in 20 countries. In the last m.i. there was published a new issue in the Journal, which was an attempt to show diagrams that were more consistent with the text and give an illustrated page of pronunciation, as in the Journal. But we will now print the Journal in the United States and Great Britain.

The Association Secretary's statement explaining the demise of Le Maitre Fonetik.

The news, which appeared in the 1970 issue, was headed "The last m.i."

All members will know, this is the last number of the m.i. 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.

Note 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...

The contents page to the last number of Le Maitre Fonetik, 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" (know [know]); whereas Lewis uses [au] in "know" (know [know]) and "each" (each [each]). The asterisk is used before a word that is a proper name.

IPA on screen: An IPA transcription tutorial, using a multimedia environment of the Computerized Speech Lab (p. 133). When students are unsure of a transcription, the vowel or consonant chart 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.

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 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 /l/ in a resonant 'slushy' manner, while another may pronounce it in a 'slapping' 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 /l/'; i.e., no matter how the /l/ varies, it continues to contrast with /l/, /l/, and other words. There's 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: /aʊ/ is different from /u/, for example, because there are pairs of words (such as sea and seat) which can be distinguished solely by replacing one of these vowels by the other. All the vowels in the list on p. 227 (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 /gæ/ (pen) and /θɛŋ/ (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.

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 the hard and soft palate meet)
5. back of the tongue (opposite the soft palate)
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 ma is a click sound, 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 ma click, for example, expresses disapproval in English, but the sound is not used as part of a word, in the way that /l/ 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. Xhosa is one such language, with as many as 48 clicks (p. 170). The Khoisan languages, which include the languages of the Khoe (Hottentots) 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 glottal airstream mechanism. When the glottis makes the air move inwards, the sounds are called implosive. An implosive consonant is a glottal ingressive sound. When the air is made to move outwards, the sounds are called explosive. An explosive consonant is a glottal egressive sound.

Implosive consonants occur in many languages, but are particularly common in American Indian and African languages (such as Shona and Jago). Explosive 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.
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. Snorting, for example, is a common occurrence in everyday conversation. The sound is produced by forcing air through the nostrils. However, the sound tends to be low and muffled, and is often used as a form of nonverbal communication.

On the other hand, other air-stream mechanisms are occasionally used when people communicate. A velar fricative sound (the same mechanism as a click) is produced when the tongue is raised to the velum, and the air is forced through a narrow passage between the tongue and the velum. This sound is used in some languages, such as the clicks of the Bushmen, to signal to others.

Abnormal air-stream mechanisms are also used in special circumstances. For example, a person can produce a sound by holding their breath, then suddenly releasing it through the mouth. This sound is called a hiss, and is often used to signal a warning or to get the attention of others.

It is also possible for a person to produce a sound by using their voice box to control the flow of air. This is called a vocal fry, and is used in some languages to produce a deep, throaty sound. However, this sound is not often used in everyday conversation.

In conclusion, while vocal fry is not a common occurrence in spoken language, it is an interesting example of an abnormal air-stream mechanism that can be used to produce a variety of sounds. Further research is needed to understand the role of vocal fry in human communication.
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 (over) or lowered (neutral) (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 1.

1. Bilabial. Both lips are involved in the articulation, e.g. [p], [b], [m].
2. Labiodental. The lower lip articulates with the upper teeth, e.g. [f], [v].
3. Dental. The tongue tip and some articulates 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. 120), e.g. [s], [t], [z]. Sounds articulated at the rear of this ridge (e.g. [s], as in some pronunciations of self are sometimes classified separately as post-alveolar.
5. Retroflex. The tip of the tongue is curved back to articulate with the area between the rear of the alveolar ridge and the front of the hard palate, e.g. [r], [l], 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. [t], [l], as in th in thin and French e respectively.
7. Palatal. The front of the tongue articulates with the hard palate, e.g. [c], [t], as in German ich and j respectively.
8. Velar. The back of the tongue articulates with the soft palate, e.g. [k], [g].
9. Glottal. The back of the tongue articulates with the uvula, e.g. [ʔ], 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. [h], [f], both found in Arabic.
11. Glottal. The vocal folds come together to cause a closure or friction, e.g. [th], [th] (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.

SOME CONSONANT PLACES OF ARTICULATION

- Bilabial (p) and (b)
- Alveolar (s) and (3)
- Velar (t) and (3), when followed by an (l) sound
- Labio-dental (θ) and (ð)
- Dental (θ) and (ð)
- Alveolar (s) and (3)
Phonetics is the study of how speech sounds are made, transmitted, and received. 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 §2 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 analyzing 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).

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 another way of drawing the distinction. Not all 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 we use 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 (§15). 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. 153).

**PHONEMES**

Phonological analysis relies on the principle that certain sounds cause changes in the meaning of a word or phrase, whereas others do not. An early approach to this problem 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. ([p] or [b], for example, are both acceptable phonetic symbols for the sound represented by the vowel [i].)

In a similar way, [i] and [e] can be shown to be important units, because they distinguish pig and big, pan and bun, and many other word pairs.

The analysis suggests that [p] and [b] are thus important sounds in English, because they enable us to distinguish between pig and big, pan and bun, and many more word pairs.

A phonological analysis of pig, for example, would be: [p_i_g].

In a similar way, [i] and [e] can be shown to be important units, because they distinguish pig and big, pan and bun, and many other word pairs. And so we could continue, using this technique to determine how far this is the case - the minimal pairs test - to find out which sound substitutions cause changes 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], [i], etc. This shows that the units are being seen as part of a language, and not 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 show and she have very different sound qualities (p. 158). For show, the lips are rounded, because of the influence of the following [u] vowel, for
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 close 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 [ʃ] and [ʃ], but other languages do (e.g. Lak). Sound differences which separate allophones in English may separate phonemes in another language, and vice versa—a principle that is clearly illustrated by the sounds of such words as [ʃ] and [ʃ]. The first [ʃ] ('clear') is articulated much further forward in the mouth than the second [ʃ]—as can be felt, if the sounds are said slowly to oneself. In English, these are allophones of a single /ʃ/ phoneme. In Russian, however, they are different phonemes.

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 tend to 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 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 /p/ by strongly aspirated /p/ 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. 316). 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/ is a voiceless palato-alveolar fricative, and the /p/ is a voiceless bilabial plosive. 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 /b/ and /p/: 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 being consonants—/b/ is a voiced glottal fricative, /p/ is a voiced nasal consonant.

HOW MANY MINIMAL PAIRS ARE THERE?

A convenient way of displaying a language's phonemic structures is to construct a chart of possible words or syllables. Below is a part of a chart adapted from Denby and Rockey's 'Phonemic Lexicon' (1973, pp. 56–7). It shows some of the 17 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. 54). Linguists can compare the use a language makes of individual combinations of phonemes and thus calculate the amount of work a phonemehas 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 Zuckerman'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 /b/ as in /p/.
### The English Consonants

<table>
<thead>
<tr>
<th>Stops</th>
<th>Labial</th>
<th>Dental / Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>[vl]</td>
<td>[p]</td>
<td>[t]</td>
<td>[č]</td>
<td>[k]</td>
</tr>
<tr>
<td>[vd]</td>
<td>[b]</td>
<td>[d]</td>
<td>[j]</td>
<td>[g]</td>
</tr>
</tbody>
</table>

**Fricatives**

<table>
<thead>
<tr>
<th>[vl]</th>
<th>[f]</th>
<th>[θ]</th>
<th>[s]</th>
<th>[š]</th>
<th>[h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[vd]</td>
<td>[v]</td>
<td>[ð]</td>
<td>[z]</td>
<td>[ž]</td>
<td></td>
</tr>
</tbody>
</table>

**Nasal**

<table>
<thead>
<tr>
<th>[m]</th>
<th>[n]</th>
<th>[ŋ]</th>
</tr>
</thead>
</table>

**Semi-vowel**

<table>
<thead>
<tr>
<th>[w]</th>
<th>[y]</th>
</tr>
</thead>
</table>

**Glide/Liquid**

<table>
<thead>
<tr>
<th>[l]</th>
<th>[r]</th>
</tr>
</thead>
</table>

### The English Vowels

#### Front

<table>
<thead>
<tr>
<th>High Tense</th>
<th>Lax Tense</th>
<th>Central Retroflexed</th>
<th>Low Tense</th>
</tr>
</thead>
<tbody>
<tr>
<td>[i] Beet</td>
<td>Hi Front</td>
<td>Hi Back</td>
<td>Low Front</td>
</tr>
<tr>
<td>[æ] Mid</td>
<td>Lax bit</td>
<td>Lax foot</td>
<td></td>
</tr>
</tbody>
</table>

#### Central

<table>
<thead>
<tr>
<th>Beat Tense</th>
<th>Lax Tense</th>
<th>Boot Tense</th>
</tr>
</thead>
<tbody>
<tr>
<td>[æ] Mid</td>
<td>Lax butt</td>
<td>Mid Back</td>
</tr>
<tr>
<td>[ø] Mid Central</td>
<td></td>
<td>boat</td>
</tr>
</tbody>
</table>

#### Back

<table>
<thead>
<tr>
<th>Boot Tense</th>
<th>Lax Tense</th>
<th>Pot Tense</th>
</tr>
</thead>
<tbody>
<tr>
<td>[u]</td>
<td></td>
<td>[a]</td>
</tr>
</tbody>
</table>

Low Back
**English Consonant Phonemes**

<table>
<thead>
<tr>
<th></th>
<th>Labial (incl Bilabial, Labiodental, and Labiovelar)</th>
<th>Dental (Interdental)</th>
<th>Alveolar (incl Alveolar, Lateral, and Retroflex)</th>
<th>Palatal (incl Affricate and Sibilant)</th>
<th>Velar (incl Pharyngeal and Labiovelar)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voiceless</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vl</td>
<td><strong>p</strong></td>
<td><strong>t</strong></td>
<td><strong>tʃ</strong></td>
<td><strong>k</strong></td>
<td><strong>cat</strong></td>
</tr>
<tr>
<td>Vd</td>
<td><strong>b</strong></td>
<td><strong>d</strong></td>
<td><strong>dʒ</strong></td>
<td><strong>g</strong></td>
<td><strong>get</strong></td>
</tr>
<tr>
<td><strong>Fricative</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(incl Sibilant)</td>
<td><strong>f</strong></td>
<td><strong>θ</strong></td>
<td><strong>ʃ</strong></td>
<td><strong>h</strong></td>
<td><strong>hat</strong></td>
</tr>
<tr>
<td>Vd</td>
<td><strong>v</strong></td>
<td><strong>ð</strong></td>
<td><strong>z</strong></td>
<td><strong>ʒ</strong></td>
<td><strong>azure</strong></td>
</tr>
<tr>
<td><strong>Nasal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Vd)</td>
<td><strong>m</strong></td>
<td><strong>n</strong></td>
<td><strong>ŋ</strong></td>
<td><strong>j(y)</strong></td>
<td><strong>you</strong></td>
</tr>
<tr>
<td><strong>Semivowel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Vd)</td>
<td><strong>W</strong></td>
<td><strong>j(y)</strong></td>
<td><strong>w</strong></td>
<td><strong>y</strong></td>
<td><strong>wing</strong></td>
</tr>
<tr>
<td><strong>Lateral</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid (Vd)</td>
<td><strong>l</strong></td>
<td><strong>r</strong></td>
<td><strong>ring</strong></td>
<td><strong>let</strong></td>
<td><strong>let</strong></td>
</tr>
</tbody>
</table>

- **Vl Stops** /p,t,tʃ,k/ are **aspirated** [pʰ,tʰ,tʃʰ,kʰ] syllable-initially before stressed vowel: *spin* [spɪn] ~ *pin* [pʰɪn], *stop* [stɒp] ~ *top* [tʰɒp], *scoff* [skɒf] ~ *cough* [kʰʊf], etc.
- Palatal Affricates /tʃ,dʒ/ end in **sibilants** and pattern with others /s,ʃ,z,j/ in final {-Z} suffixes: *churches* /tʃərs/ʃ/, *judges* /dʒədʒ/ʃ/, *kisses* /kɪs/ʃ/, *Bess’s* /bɛs/ʃ/, etc.
- Resonants (Nasals and Liquids) can be **syllabic** (i.e., function as vowels): *gargle* /gɑrɡ/ʃl/, *happen* /hæp/ʃn/, *purple* /pʰɜrpl/ʃl/.
- All consonants are subject to **fast speech rules** of deletion, reduction, or merger: [dʒɪtʃɪt] *Did you eat yet?*, [kʰɪpʃɪ] *Can I help you?*, [zɪθɛmɪs] *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 on the scale 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 sets 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 sound 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. As an example, the sound begins with an open /i:/ vowel and ends with a close /u:/ vowel. It is important to note that here we are talking about phonetic diphthongs, not graphic ones: the sounds in my, my, my, my, and my, 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 boy/boy, boy/boy, and boy/boy, for example, can all be analysed in this way. No new symbols are required, however, as each can be seen as a combination of a diphthong /ai/.
- 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 my man (i.e., my man/ has become /my man/). An example of the latter is the British mock pronunciation of my feet as my feet.

### 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. Gibson 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 Gibson 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—no 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. 175), Gibson (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 /a:/, 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 (FRA) in an introduction to Language (1st ed., 1974), a widely used teaching textbook in the USA. It is a simplified version of the inflected system devised by John H. Kern and Thomas A. Knott in A Pronouncing Dictionary of American English (1933), which aimed to provide a standard transcription for the vowels of the main dialect of American English.
- The final column in the table lists a few other symbols which are often used in representing certain vowels. Some are purely typographic variants, some represent a particular sound effect, such as the presence of a lipping (p. 245); and /a:/ is often used as a simple alternative to /a/.
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 /f/ 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 analyzed 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, In 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 relationships 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-morphology terminology of §27).

**English consonant matrix**

|            | p | b | f | v | m | θ | s | z | η | ʃ | z | s | j | k | ɡ | l | r | w | h | ŋ |
| consonantal| + | - | - | - | - | + | - | - | - | + | - | - | + | - | - | - | - | - | - | - | - |
| vocalic    | - | + | - | - | - | - | + | - | - | - | - | - | - | - | - | + | - | - | - | - | - |
| diffuse    | - | - | + | - | - | - | - | + | - | - | - | - | - | - | - | - | - | - | - | - | - |
| compact    | - | - | - | + | - | - | - | - | + | - | - | - | - | - | - | - | - | - | - | - | - |
| -voice     | - | - | - | - | + | - | - | - | - | - | + | - | - | - | - | - | - | - | - | - | - |
| -continuant| - | - | - | - | - | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| -resident  | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| nasal      | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Matrix for a seven-vowel system**

<table>
<thead>
<tr>
<th>i</th>
<th>a</th>
<th>u</th>
<th>o</th>
<th>ə</th>
<th>ɔ</th>
</tr>
</thead>
<tbody>
<tr>
<td>consonantal</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>vocalic</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>diffuse</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>compact</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-voice</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-continuant</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-resident</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note: (After R. Jakobson & M. Hallé, 1956.*)
PHONOLIGICAL 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 telephone and telegraph. A phonological analysis of these words is not complete simply by giving each a phonemic transcription: /tel'og/ vs /tele'graf/. 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 microscop/ 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 [deba] (jade), with a 'voiced' sound. This observation can be summarized in the form of a rule: [b] becomes [h] 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 \( \Rightarrow \) means 'becomes'; \( i' \) means 'in the context of'; and \( i' \) means 'word boundary'):

\[
[b] \Rightarrow [h] /i' \#
\]

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

\[
\begin{array}{c|c|c|c}
\text{[+ consonantal]} & \text{[+ consonantal]} & \text{[+ nasal]} & \text{[+ voice]}
\end{array}
\]

(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 are 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 ['filem']. A deletion rule occurs when vowel segments are regularly omitted from such phrases as 'I am' (\( \Rightarrow \) 'im') in certain grammatical contexts. There are also rules that combine two segments at once, as when would you become ['wordz'] (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. It 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.

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ABSTRACT OR CONCRETE?

In order to arrive at satisfying generalizations, phonologists have often introduced abstract underlying forms into their rules from which several phonemic variations can be derived. For example, the words 'impossible', 'indeed', and 'innocuous' all begin with the same prefix, meaning 'not', but the pronunciations differ in the first case, being [im] (because of the following bilabial); in the second case it is [in] (before the alveolar consonant); and in the third case, for many speakers, it is [in] (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 [i'm], where 'N' stands for a nasal feature.

This solution seems reasonable, as 'N' seems clearly related to the three pronunciations, each of which is a nasal. But what happens if we extend the example to include such forms as 'irregular and liberal'? Again, the prefix means 'not', and the differences seem to result from the following sounds. Should we therefore group [i'm] and [i'n] along with ['in'], and [i'l], 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, and there are no longer seems appropriate, as two of the sounds are not nasal: words 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 allow all the sounds to be grouped together, yet sufficiently concrete to be plausibly the representation of what is taking place. It would be possible to invent a category [X], where 'X' = [m, n, g, l, r], but this seems an arbitrary solution, which lack 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 generalizations of this kind do or should express psychological reality - that is, represent the native speaker's intuition 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 an explicit connection to the physical 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 ("I shall 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, metal, and library 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 of a word, but smaller than a word. However, the 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 phonologist R. H. Stetson (1892–1950) was one who argued that each syllable corresponds to an increase in air pressure, and from the lungs being released as a series of chest pulses—the pulse or meter theory of syllable production. These pulses can often be readily heard and measured, especially when people speak emphatically.

The main objection to the theory is that the pulses are sometimes difficult to detect—for example, in adjacent syllables when two vowels co-occur (as in the word doing, which is a two-syllable word, but 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 as a metrical unit, arguing that some sounds—vowels—are systematically more sonorous than others (p. 134), and that each peak of sonority corresponds to a syllable 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 master, mas-ter, or mas-ter? We are left with this problem, even though in each case the relative sonority of the sounds in these is the same.

A phonological approach

Phonological views of the syllable focus on the way sounds are used in a language to produce typical sequences. Two classes of sound are established: sounds that can occur on their own, or are at the center of a sequence of sounds (sonority); and those that cannot occur on their own, or are at the edge of a sequence (resonance) (p. 134). Typical sequences include CV, CVH, CVCV, etc. In this way the range of syllabic types 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 — CCCVCCC, as in some pronunciations of strength).

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 the case of the tongue, for example, the kinds of substitutions generally display the influence of syllable structure: initial consonants tend to replace each other, as do final consonants. Thus one study reports many reversals of the types [desk and weebie] for [weak and freeble] or [tuff shielp] for [tuff shirep], but there are few reversals that mix up places in syllable structure (p. 134).

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 study (p. 167) include:

- Hawaiian: 163
- Yoruba: 350
- Tamil: 582
- Guaj: 968
- Cantonese: 2,331
- Quechua: 4,068
- Vietnamese: 2,468
- Thai: 23,336

JUNCTURE

Phonetic boundaries demarcate words or other grammatical units. There are several phrases in English that are indistinguishable in this way:

- that stuff is a tough job
- I scream for ice cream
- nitrate is right for a nap

In the first case, for example, the list of stuff is a stronger word; 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 of the left are heard when the words are said in isolation, or with emphasis, when they are said in normal conversation:

- a jec / jek / jed
- a jec / jad / jed, / ad
- a jec / jad / ed, / ad
- a jec / jad / ed, / ad, / ed
- a jec / jad / ed
- a jec / jad / ed

Elision

In rapid speech, sounds may be dropped, 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, stopped speaking, good to go, etc. The initial velar fricative may be elided 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 [s] of chez pronounced when followed by a vowel. It can also be illustrated from English Received Pronunciation (p. 39). In this context, the final [s] is not pronounced in such words as four and farther, 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 [s] is regularly used, as in four tock or father and mother.

Aspiration

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 bakes being pronounced as ten bakes.

These effects partly illustrate the role of phonetic context (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 University of California, Los Angeles Phonological Segment Inventory Database). 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 (§30)).

The segments were analyzed as phonemes (p. 162), each unit being represented by its most characteristic variant. (After I. Maddison, 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: Rukus (Indo-Pacific) and Miura (Chibcha). Several Polynesian languages are known to have very small inventories. By contrast, the largest inventory belonged to Kus (Khoisan), with 141 segments, with several other languages of this family displaying comparable large totals. Between these extremes, 70% of the languages in the sample had between 20 and 37 segments.

When the inventories are analyzed 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 1.303. 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 (American), with 46C but only 3V, and Pawatin (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 /l/, it will also contain $/n/$. There is only one exception (Hawaiian) to the statement that if /h/ occurs, then /i/ will occur (though /i/ can in fact be heard in some Hawaiian varieties). Similarly, if there is /g/, there will be /d/; /j/; then /b/; and /m/; then /n/.

More generally, nasals do not occur unless stops occur at the same place of articulation (five exceptions); voiceless nasals and approximants (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 geographic 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), phonemes and glottals in Afro-Asian languages, retroflex consonants in South Asia, or implosives and labiovelar 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 (labial and dental phones are grouped together): p b l d q k g j f s m n n h r l

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., Sambari (Roger Conga), which lacks /j/ and includes /l/ and /d/.

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 sibilants. No one segment is found in all languages. (After I. Maddison, 1984.)

What 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 women 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 stops are much less common, such as aspirated (29%), voiceless ejectives (15%), 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 Xu (Khoisan), each with six types. The Igbo inventory, for example, is as follows:

5 voiceless unaspirated plosives
5 voiceless aspirated plosives
5 voiced plosives
2 voiceless implosives

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 /f/ and /h/, then /ts/, /s/, and /h/ in that order. The asymmetry between /s/ and /s/ 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
2 voiceless sibilant
1 voiceless non-sibilant
ejective
1 voiceless lateral

NASALS

Almost all UPSID languages (97%) have at least one phoneme whose main allophone is a nasal 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 'approximants' sounds (/w/ and /j/) (p. 158). Most languages (98%) 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 latials, and 2 voiceless latials). At the other extreme, several languages have none, such as Nooroo (Amerindian). The majority of liquids are voiced (83%); 87% of them are dental/alveolar. The most common /l/ segments are also voiced (97%), and involve rapid tongue-tip movements (trills, taps, and flaps - 86%). Uvular /j/, found in French and German, is not a common segment.

The approximants are also widely used. /r/ segment is found in 88% of the languages, a /w/ segment in 76%.

GLOTTALICS

Ejectives are the most common consonant to use a glottalic airstream (pp. 126-7). They are typically voiceless (97%) 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 /i/. 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 /i/. Some languages have as many as four such segments: bilabial, dental/alveolar, palatal, and velar or uvular.
VOEWS
The 2,549 vowel segments in the UPSID data can be classified on the basis of place and manner of articulation as follows:

It can be seen that front vowels are usually unrounded (94%), and back vowels are usually rounded (93.5%). Low vowels are usually central (79%), 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 Kabanian (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. Thus, the largest number of vowel segments is 24 (Khu (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 diphthongs in the entire UPSID sample. In only 23 languages. Over a quarter of these occur in just one language. Khoi, which has four series of diphthongs: oral, nasalized, pharyngealized oral, and pharyngealized nasal.

VOEWS SYSTEMS
Phonologists usually describe vowel systems with reference to the articulatory space they occupy, as represented by the so-called Cardinal Vowel diagram (p. 59). About 88% 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.)
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 UPHO survey (some phonetic symbols have been changed in the 1989 IPA revision, p. 151).

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<th>ROTOKAS (Indo-Pacific)</th>
<th>Bilabial</th>
<th>Alveolar</th>
<th>Velar</th>
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Some English Allophonic Variations

1. \( [p^\text{h}] \rightarrow [\text{f}] \quad \text{th} \rightarrow [\text{θ}] \quad k \rightarrow [\text{k}^\text{h}] \)
   
   [\text{ph}] ......... ‘pill’ [\text{sp}] ......... ‘spill’ [\text{slp}] ......... ‘slip’
   [\text{khar}] ......... ‘car’ [\text{skar}] ......... ‘scar’ [\text{rak}] ......... ‘rock’
   [\text{thay}] ......... ‘tie’ [\text{stay}] ......... ‘sty’ [\text{sæt}] ......... ‘sat’
   [\text{thpl}] ......... ‘appeal’ [\text{tiks}] ......... ‘fix’ [\text{ditθæːs}] ......... ‘detach’
   [\text{wskj}] ......... ‘walking’ [\text{spθeimbər}] ......... ‘September’ [\text{spθm}] ......... ‘septum’

2. \( [r^\text{γ}] \rightarrow [\text{γ}] \quad w \rightarrow [\text{w}] \quad y \rightarrow [\text{y}] \)
   
   [\text{kθayd}] ......... ‘cried’ [\text{rayd}] ......... ‘ride’ [\text{strim}] ......... ‘stream’
   [\text{phl}] ......... ‘plead’ [\text{lid}] ......... ‘lead’ [\text{spæs}] ......... ‘splash’
   [\text{thways}] ......... ‘twice’ [\text{wayt}] ......... ‘white’ [\text{skwɔrm}] ......... ‘squirm’
   [\text{khyut}] ......... ‘cute’ [\text{yu}] ......... ‘you’ [\text{skyu}] ......... ‘skew’
   [\text{rıkwest}] ......... ‘request’ [\text{rɛkwizɪt}] ......... ‘requisite’
   [\text{rhrint}] ......... ‘reprint’ (V) [\text{rɪprait}] ......... ‘reprint’ (N)

3. \( [m^\text{m}] \rightarrow [\text{n}] \)
   
   [\text{phizm}] ......... ‘prism’ [\text{film}] ......... ‘film’
   [\text{mɪʃn}] ......... ‘mission’ [\text{swɔrm}] ......... ‘swarm’
   [\text{pɛp}] ......... ‘often’ [\text{bɔrn}] ......... ‘barn’
   [\text{ɛvn}] ......... ‘heaven’ [\text{dʒɔn}] ......... ‘join’
   [\text{bɔn}] ......... ‘button’ [\text{ˈpɛdna}] ......... ‘Edna’
   [\text{wepn}] ......... ‘weapon’ [\text{kθæbnæt}] ......... ‘cabinet’
   [\text{mɛrm}] ......... ‘madam’ [\text{ˈsɛkni}] ......... ‘acne’
   [\text{blʌʤp}] ......... ‘bludgeon’ [\text{dizm}] ......... ‘dismal’
   [\text{pθŋ}] ......... ‘pagan’ [\text{mæɡnæt}] ......... ‘magnet’
   [\text{bɛkŋ}] ......... ‘beacon’

4. Canadian English \( [\text{ɛy} \rightarrow \text{ɛy} \quad \text{aw} \rightarrow \text{aw}] \)
   
   [\text{bɔyt}] ......... ‘bite’ [\text{bayd}] ......... ‘bide’ [\text{hɔws}] ......... ‘house’ (N) [\text{hawz}] ......... ‘house’ (V)
   [\text{θɔyp}] ......... ‘type’ [\text{rayz}] ......... ‘rise’ [\text{sbɔwt}] ......... ‘about’ [\text{rɔwci}] ......... ‘rowdy’
   [\text{laφ}] ......... ‘life’ [\text{brayb}] ......... ‘bride’ [\text{kθɔwʃ}] ......... ‘couch’ [\text{nɔw}] ......... ‘now’
   [\text{θɔyk}] ......... ‘tyke’ [\text{day}] ......... ‘die’ [\text{dɔwt}] ......... ‘doubt’ [\text{gɔwdʒ}] ......... ‘gouge’
   [\text{rɔys}] ......... ‘rice’ [\text{say}] ......... ‘sigh’ [\text{mɔwθ}] ......... ‘mouth’ [\text{pθɔwnɔd}] ......... ‘pound’
Greenlandic Eskimo

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

1. [ivnaq].............................................'bluff'  13. [gasaoloq].............................................'bark'  
2. [iperaq].............................................'harpoon strap'  14. [ikusik].............................................'elbow'  
3. [imaq].............................................'sea'  15. [qialuvaq].............................................'white whale'  
4. [tuluva].............................................'raven'  16. [qatigak].............................................'back'  
5. [itumaq].............................................'palm of hand'  17. [sakiak].............................................'rib'  
6. [sava].............................................'sheep'  18. [ugsik].............................................'cow'  
7. [nuna].............................................'land'  19. [orpik].............................................'tree'  
8. [ine].............................................'room'  20. [nerloaq].............................................'goose'  
9. [nanoq].............................................'bear'  21. [maraaq].............................................'clay'  
10. [iseraq].............................................'ankle'  22. [iga].............................................'pot'  
11. [isse].............................................'eye'  23. [igalo].............................................'house'  
12. [sermeq].............................................'glacier'  24. [sako].............................................'tool'

Greenlandic Eskimo has 5 phonetic vowels [i e o 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, [pʰ], [tʰ], [čʰ], and [kʰ]), but are not in most European languages. Learn to pronounce the unaspirated versions, which occur in English words like *spot* [spɒt] and *sketch* [skɛtʃ], 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 successive stressed syllables in an utterance), no matter how many syllables there are in the group. 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, [ɛ̃] and [əʊ]). 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 “ee” and /o/ as “oo”.

62
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 /ʊ/, and one mid /ø/. /ʊ/ can be pronounced by saying either English /iː/ if it's long, or /ʊ/ if it's short, with your lips rounded. /ø/ can be pronounced by saying either English /eː/ 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** (/aː/, /oː/, /uː/), German ‘ch’ is pronounced [χ], 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 [ʃ], but without its sibilant groove in the tongue. This alternation is allophonic in German.

**After a vowel**, the German /r/ is pronounced as [ɾ], 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 [ʁ], 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 [ɾ̩], an apical trill, exactly the same as the Spanish ‘rr’.

Finally, **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 /l/ in English ‘bidding’ [bɪdɪŋ] or ‘betting’ [bɛtɪŋ], and is always spelled with a single ‘r’; and /ɾ/, an apical trill, which is essentially a repeated tap in the same place as /r/. /ɾ/ is spelled as ‘rr’ between vowels, and as ‘r’ at the beginning of words, where it is the only ‘r’-sound that occurs. /ɾ/ is never found initially in a word.

**Spanish voiceless stops** are **never** aspirated; and Spanish /d/, /l/, and /n/ are **always** dental. **Spanish voiced stops** are pronounced as voiced fricatives between vowels. For instance, /aba/ is pronounced [aβa] (English /aː/ 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 [aDNA] ([ɔ]) is exactly the same sound as in English ‘either’ [ɪˈðər]; and /aga/ as [aɡa] ([ɣ]) is a **voiced velar fricative**, the voiced counterpart of German ‘ch’ [χ]).
The Umlaut Convention

The German word 'Umlaut' (um 'around' + Laute '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 'diéresis', 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 ū, which are
represented in IPA as [y], [ø], [e] (and [oi]), respectively. They are often
spelled u, o, ae, and æ 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]  | [i] |
| Mid:   | [ö]  | [e] |

Le, 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 Tenseress [tense, lax] is a significant
feature, are [i], [ü], [ö], and [ê], which are (respectively) the lax versions of
[i], [ü], [ö], and [ê].
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], [ð], [r], and [?] all represent the English phoneme /t/, [t], [ð], [r] and [?] 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 [r] are in free variation in [jɑːˈyər.ʃ] [jɑːˈyər.ʃ] '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:
   \[X \text{ becomes } Y \text{ in some environment } Z',\]

   OR

b. The phoneme is \(/Y/\) and the phonological rule is:
   \[Y \text{ becomes } X \text{ in some environment } W'.\]

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 \[X \rightarrow Y \ldots,\] the phonemic representation for both \([X]\) and \([Y]\) is \(/X/\); if the rule is \[Y \rightarrow X \ldots,\] 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 skórpiyen/
/bay/
/wil kápi/

/si ðə skórpiyen. wil ðə skórpiyen bayt? no, if yu ar kaynd tu ðə skórpiyen ænd trit him æz æ frend, hi wil nat bayt yu. hi wil stig yu. skórpiyenæ stig ðer pre, kənɔstɪŋ æv spáydarz ænd inækts, tu mək it bɪhɛv wæy! ðe it ðt. skórpiyenæ ænd spáydarz ær nat inækts bat æræknædz, wʊt et legz. inækts hæv ɔnli stɪks legz. wont yu træy tu rəməmber ðæt?/

/skórpiyenæ ðæn stig pɪpæl æn ðə hænz æn fit wən ænɔyd ær dʊstərbd. ðe ɔsɔ stig æn jənæəl prɪnsæpæl. ðe kərɪ ðər təlz kərld õver ðə bæks ænd ðɪlwez stig ɪn frænt æv hɛmzɛlvz. wən yu ær həgɪ ærəwɔnd æ skórpiyen, ste nɪr hɪz sæðæn ænd. yu ləŋjəu it mɔr./

/ðə póyzən æv ðə skórpiyenæ stig iz sɛldəm fɛtəl tu lærj məmæləz, bat ɪt hɑrts sæmθɪŋ fɪrs. wən kən, hæwɛvər, ækwɔɪr pɑrʃəl ʌmɔnəti bæy tɛkɪŋ ðə prɑpər stɛps. ɪf yu lɛt æ skórpiyen stig yu ëvri wæns ɪn æ wæy, hɪ ælfəks bɪkæm ɪz səvɪr ìɛ tæɪm, æntɪl fəɪnæli ɔ ɪŋ ðə nətæs iz ðə sɛnsəʃən æv bɪtuq stæb æn yət wɪð æn æys pɪk ænd æ slæyt dɪzɪ fɪlɪg fər sɛvrəl dɛz. æv əv nɛvər træy ðəs ɔməsɛlf. wæt wɪð wən ætæŋ æn ænædər, æm ðɪlwez pʊtɪŋ ʊt æf./
/đe skórpiyan lidz a sálatéi layf for ȷe most part, ëz bi haez a lo
ápínyan av ol áíar skórpiyanz. òe hét ùer kaynd, êksépt in me, jun,
jéláy, an ëgast, wen òe go ta ëi ápasat êkstrím. in ëiz mañds òe
skórpiyan ënd òe skórpiyanés tek lay strolz, pínser ùn pínser, stànd
on òer hedz, ënd kérì on rigárdìas. üt izant lèv, rìali. üts màr av ø
màed unfàcùwèshän.

/ðën òe skórpiyanés dàvawrz har met ënd ëàêts òe lëst av hùm.
simz az òo òis hábeat av hærz wud set aràwnd ëmàg òë felàz, ët hòz hu
no most abàwùt ùt ar un no kàndìsìen tà mek ø rapòrt. bëbi skórpiyanz
rùmèn wù òer màðàr ìor òe ìàrst tu wìks, ràydìg øn ar bàëk, frìskìg
mèrèli un òe gràës, ënd gròwùg mìñàr èvéri mìñèt. ay sàpòz øy øt òa ñìl
sùri ñàr skórpiyanz bùkàz òe ñà so ñàfèl. ayl òìjk ùt òvàr./

1. /wel, yu niànt get sor øt mi. ay haeò ñàñg tu du wù ùt./

2. /skórpiyanz ken bi këpt fàr äbzarvèshànz un ø glàèz jàr wù ùt üt
ø Scott fiòg ñà ñàd.

3. /if yu òìjk yu haeò skórpiyanz ñàñèr yar ëèdùm flòr, rùmèìbèr ñàt
skórpiyanz luì ñòli layì glùr./

4. /bëò pàrtnèrz ar ekstrìmìli rìpàlsàv, fòrèñà Elliott, skórpiyanz haeò pùr
Àyìsàvt./

5. /skórpiyanz nèvér stìg ñàmélìz ta déòò, no màtt ñàt ëòìt nays ñìd
jéntèlmèn told yu. ët go ahëd an bulìv ùt, if yùd ràðèr. ñërz no lo
Ììgènt ùt./
/in may apînyen si sfpnts av srynayvd främ priyœstorëk laymz, wen ña wîld wæz yag n fûles. mos prafêsrz se at az am̀pàsëb! dat éni av ñoz krûrçz ñud stûl aqûst. ñe me bi masteññ. aë kànstøntli mit pîp! hu ñ seprâyzd ñy stûl aqûst./

/wen ñuq abâw! si sfpnts apûrçz te bi sftp - îîf yu si ñam ñ yu don. ñoz hu du hæv ñiwez imprést mi az jàli gud féloz ñ kanvíyiy! kômpàññøz wîq ìntràstûg poyns av yvu ñ a réði ñlo av kanvøsëññ. ñoz hu don! ñ ñuq prûti dræb. méni pîp! go ñru layf wîtåw! sîynj ñvø e lëf wên. aëv nèvr sin bët tu av ñam mysëlf./

1. /slo ræëmblûg sîwid./

2. /sà prût ñ kàpûr èv e lañj pis av flûtûg sîwid bay kàptæn frûdræk smîè av ña ñip pikàñ on dæëmbë twenîyètë, ættnortët, pruvz nàûg wëtëvø. ñæt kud hâpë ta ?ëníbëdë./

3. /ðen wayîznût ën ol tri træqk, ñykø jëst hëryu ñeskûg. huz télûq ñis lay, yûwûmi?/

4. /kàmpûr ña pëkyûlypr spïsiz daskräybd, sâmwaë dîfràntî, bay ëvri mæn aƀôrd ña mëni, bawad ñf lûvûpul wîd ñ kàrgo av râm, ëttinsevnïtû./

5. /nàûq az nom abâw! ña lëf layf èv ña si sfpnt. ñu mëst bi hûrëb!/


/sampəl fneks kwiz/

Name____________________ /nem/ /______________/

Write the word below in standard orthography. Spell correctly.

(1) /sʌt/ ____________________________
(2) /lúzə/ ____________________________
(3) /pálts/ ____________________________
(4) /lúzə/ ____________________________
(5) /gəˈɑːz/ ____________________________
(6) /mæt/ ____________________________
(7) /sæd/ ____________________________
(8) /sæd/ ____________________________
(9) /bɔk/ ____________________________
(10) /rɛˈʃəl/ ____________________________

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)

[g] ________________________________
[ɛ] ________________________________
[ŋ] ________________________________
[ɔ] ________________________________
[θ] ________________________________
[o] ________________________________
[θ] ________________________________
[e] ________________________________
[a] ________________________________
[ɐ] ________________________________
[ɑ] ________________________________

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

voiceless dental nasal [ ]
labiodental fricatives [ , ]
voiced palatal sibilant [ ]
high back rounded vowels [ , ]
high front rounded vowel [ ]
velar stops [ , ]
voiceless retroflex stop [ ]
An American English Dialect

<table>
<thead>
<tr>
<th>Phonetic</th>
<th>Phonemic</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 [sæ{l}t]</td>
<td>/sæld/</td>
<td>salad</td>
</tr>
<tr>
<td>2 [sæ{l}dz]</td>
<td>/sældz/</td>
<td>salads</td>
</tr>
<tr>
<td>3 [bɛd]</td>
<td>/bɛd/</td>
<td>bed</td>
</tr>
<tr>
<td>4 [bɛdz]</td>
<td>/bɛdz/</td>
<td>beds</td>
</tr>
<tr>
<td>5 [stʊpɪd]</td>
<td>/stʊpɪd/</td>
<td>stupid</td>
</tr>
<tr>
<td>6 [stʊpɪdlɪ]</td>
<td>/stʊpɪdlɪ/</td>
<td>stupidly</td>
</tr>
<tr>
<td>7 [risɪrɪt]</td>
<td>/risɪrɪd/</td>
<td>reseated</td>
</tr>
<tr>
<td>8 [bɛlɪt]</td>
<td>/bɛlɪd/</td>
<td>balad</td>
</tr>
<tr>
<td>9 [bɛlɪdz]</td>
<td>/bɛlɪdz/</td>
<td>balads</td>
</tr>
<tr>
<td>10 [tɛpɪd]</td>
<td>/tɛpɪd/</td>
<td>tepid</td>
</tr>
<tr>
<td>11 [bɛdɪŋ]</td>
<td>/bɛdɪŋ/</td>
<td>bedding</td>
</tr>
<tr>
<td>12 [rɪpɪt]</td>
<td>/rɪpɪt/</td>
<td>repeat</td>
</tr>
<tr>
<td>13 [wɛt]</td>
<td>/wɛt/</td>
<td>wait</td>
</tr>
<tr>
<td>14 [wɛrɪt]</td>
<td>/wɛdɪd/</td>
<td>waded</td>
</tr>
<tr>
<td>15 [hɛɪd]</td>
<td>/hɛɪd/</td>
<td>hide</td>
</tr>
<tr>
<td>16 [tɛrɪd]</td>
<td>/tɛrɪd/</td>
<td>tried</td>
</tr>
<tr>
<td>17 [rɪpɪrɪt]</td>
<td>/rɪpɪrɪd/</td>
<td>repeated</td>
</tr>
<tr>
<td>18 [rɛɪt]</td>
<td>/rɛɪdɪŋ/</td>
<td>riding</td>
</tr>
<tr>
<td>19 [skɛrɪt]</td>
<td>/skɛtɪŋ/</td>
<td>skating</td>
</tr>
<tr>
<td>20 [skɛrɪt]</td>
<td>/skɛtɪd/</td>
<td>skated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phonetic</th>
<th>Phonemic</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 [bɛt]</td>
<td>/bɛt/</td>
<td>bet</td>
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<tr>
<td>22 [rɛbɪt]</td>
<td>/rɛbɪt/</td>
<td>rabbit</td>
</tr>
<tr>
<td>23 [rɛbɪts]</td>
<td>/rɛbɪts/</td>
<td>rabbits</td>
</tr>
<tr>
<td>24 [risɪt]</td>
<td>/risɪt/</td>
<td>reseat</td>
</tr>
<tr>
<td>25 [risɪrɪt]</td>
<td>/risɪrɪd/</td>
<td>receded</td>
</tr>
<tr>
<td>26 [rɛpɪl]</td>
<td>/rɛpɪd/</td>
<td>rapid</td>
</tr>
<tr>
<td>27 [rɛpɪdz]</td>
<td>/rɛpɪdz/</td>
<td>rapid</td>
</tr>
<tr>
<td>28 [rɛbɪt]</td>
<td>/rɛbɪd/</td>
<td>rabid</td>
</tr>
<tr>
<td>29 [rɛbɪdlɪ]</td>
<td>/rɛbɪdlɪ/</td>
<td>rabidly</td>
</tr>
<tr>
<td>30 [rɛsɪd]</td>
<td>/rɛsɪd/</td>
<td>recede</td>
</tr>
<tr>
<td>31 [hɛɪt]</td>
<td>/hɛɪt/</td>
<td>height</td>
</tr>
<tr>
<td>32 [wɛd]</td>
<td>/wɛd/</td>
<td>wade</td>
</tr>
<tr>
<td>33 [wɛrɪt]</td>
<td>/wɛdɪd/</td>
<td>waded</td>
</tr>
<tr>
<td>34 [tɛrɪ]</td>
<td>/tɛrɪ/</td>
<td>try</td>
</tr>
<tr>
<td>35 [bɛrɪ]</td>
<td>/bɛrɪ/</td>
<td>betting</td>
</tr>
<tr>
<td>36 [tɛrɪ]</td>
<td>/tɛrɪt/</td>
<td>trite</td>
</tr>
<tr>
<td>37 [rɛɪt]</td>
<td>/rɛɪtɪŋ/</td>
<td>writing</td>
</tr>
<tr>
<td>38 [kɛrɪ]</td>
<td>/kɛtɪ/</td>
<td>Katy</td>
</tr>
<tr>
<td>39 [fɛrɪ]</td>
<td>/fɛdɪŋ/</td>
<td>fading</td>
</tr>
<tr>
<td>40 [fɛrɪ]</td>
<td>/fɛdɪd/</td>
<td>faded</td>
</tr>
</tbody>
</table>

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 .................................[øy]
- taps ....................................................................[ɾ]
- final dental stops ...........................................[t, d]
- aspirated stops ..............................................[tʰ, kʰ, pʰ]
- long vowels ....................................................[æ:, e:, 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 [e:, etc.] are important; don’t ignore them.
GERMAN

1. axt..............................eight  
2. bux..............................book  
3. lox..............................hole  
4. hox..............................high  
5. rawxan..........................to smoke  
6. medçan..........................girl  
7. çemi..............................chemistry  
8. uç..............................!  
9. eçt..............................real  
10. lexan............................to laugh  
11. leçæn............................to smile  
12. rayçan............................to reach  
13. moçst..................[you sg] would like  
14. büçar..............................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

<table>
<thead>
<tr>
<th>[ɔ]</th>
<th>[o]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ṣgõma.....................drum</td>
<td>12. watoto................children</td>
</tr>
<tr>
<td>2. bõma.......................fort</td>
<td>13. ndoto.....................dream</td>
</tr>
<tr>
<td>3. gõmba.......................cattle</td>
<td>14. mboga.....................vegetable</td>
</tr>
<tr>
<td>4. bamba.......................pipe</td>
<td>15. ndogo......................little</td>
</tr>
<tr>
<td>5. õmba.........................pray</td>
<td>16. jëgo.......................rooster</td>
</tr>
<tr>
<td>6. ana..........................see</td>
<td>17. šoka......................ax</td>
</tr>
<tr>
<td>7. poña..........................cure</td>
<td>18. okota.....................pick up</td>
</tr>
<tr>
<td>8. ñõña..........................nurse</td>
<td>19. mojä......................one</td>
</tr>
<tr>
<td>9. ñiña..........................taste</td>
<td>20. mlego......................trap</td>
</tr>
<tr>
<td>10. oggeza.....................increase</td>
<td>21. kõndo*..................sheep</td>
</tr>
<tr>
<td>11. õgoغا..........................strangle</td>
<td>22. karoggo*................wash-out</td>
</tr>
</tbody>
</table>

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. hasi.......................chopsticks | 5. hōhō......................method |
| 2. sofū.........................grandfather | 6. fuku......................clothes |
| 3. hel.........................fence | 7. cicāri.....................left |
| 4. kōči.....................coffee | 8. hana......................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)

<table>
<thead>
<tr>
<th>b'uhu</th>
<th>sack</th>
<th>b'o:ye</th>
<th>hide</th>
<th>karfa</th>
<th>receive</th>
</tr>
</thead>
<tbody>
<tr>
<td>gani</td>
<td>see</td>
<td>k'udi</td>
<td>money</td>
<td>sab'o</td>
<td>new</td>
</tr>
<tr>
<td>ka'tau</td>
<td>very</td>
<td>k'unne</td>
<td>ear</td>
<td>k'o:fa</td>
<td>doorway</td>
</tr>
<tr>
<td>k'o:</td>
<td>or</td>
<td>ba:k'yi</td>
<td>mouth</td>
<td>k'ye:</td>
<td>you</td>
</tr>
<tr>
<td>lo:k'ti</td>
<td>time</td>
<td>kare:</td>
<td>finish</td>
<td>d'auk'y'e</td>
<td>take</td>
</tr>
<tr>
<td>dža:k'yi</td>
<td>donkey</td>
<td>g'ida:</td>
<td>house</td>
<td>g'obe</td>
<td>tomorrow</td>
</tr>
<tr>
<td>k'o:yo</td>
<td>learn</td>
<td>gabas:</td>
<td>east</td>
<td>kata:k'o:</td>
<td>lumber</td>
</tr>
<tr>
<td>karše:</td>
<td>end</td>
<td>k'usa:</td>
<td>near</td>
<td>ɓ'untu:</td>
<td>rice-husks</td>
</tr>
<tr>
<td>le:ɓe</td>
<td>lip</td>
<td>kare:</td>
<td>dog</td>
<td>k'ullum:</td>
<td>everyday</td>
</tr>
<tr>
<td>sauk'y'i</td>
<td>ease</td>
<td>g'umi:</td>
<td>sweat</td>
<td>k'undu:</td>
<td>gizzard</td>
</tr>
<tr>
<td>ba:y'a</td>
<td>back</td>
<td>biyu:</td>
<td>two</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

\[
\{ b \quad b' \quad ɓ \quad ɓ' \quad k \quad k' \quad k'\' \quad g \quad g' \quad g'\}
\]

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:** \{ b' \quad ɓ' \quad k' \quad g' \} are **labialized** stops (i.e., produced with rounded lips).

\{ k' \quad k'\' \quad g' \} are **palatalized** stops (i.e., produced with the tongue body raised toward the palate).

\{ k \quad k' \quad k'\'} are **ejective** stops (i.e., produced with a simultaneous glottal closure).
CANADIAN FRENCH

1. abîm  abyss  15. plozîb  plausible
2. avî    advice  16. vît     quickly
3. katôlik  Catholic  17. reßîm  regime
4. šîk    chic     18. riš     rich
5. vid    empty    19. mirakl  miracle
6. eneržî  energy  20. si      saw
7. frôsin  Francine 21. žig    shank
8. kôpri  included 22. lis     smooth
9. vi      life     23. sporcif  sporty
10. vîzaž  face     24. ekip    team
11. liñ    line     25. mersî   thanks
12. pip    pipe     26. fil     wire
13. pîse   urinate  27. dine    dine
14. miñô   tiny

The high front vowels [i] (higher) and [î] (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 devoci es certain vowels, with an effect something like a whispered vowel. Whether or not this devocing takes place depends on several factors, including the rate and style of speech: the faster and more casual the speech, the more devocing.

The data below, given in phonetic transcription, illustrate this phenomenon. Some of the symbols used deserve special comment. [u] represents a high, back, unrounded vowel; [f] is a voiceless bilabial fricative; [r] 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 devocing, in the sense that it will be devoced in at least some styles of speech; vowels without this symbol are never devoced. The apostrophe indicates the position of the Japanese pitch accent.

Analyze these data to discover the rule or rules that determine which vowels are eligible for devocing. 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 devocing 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 devocing can take place?

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

1. ha'oke 'dry field'
2. su'kiyaki 'sliced beef dish'
3. so'ji 'and then'
4. mu'ra'saki 'purple'
5. wa'taru 'go across'
6. wa'tasw 'hand over'
7. su'ki 'moon'
8. tu'ku 'arrive'
9. sa'simi 'raw fish dish'
10. mo'simo'shi 'hello (on telephone)'
11. qito'ri 'one person'
12. qito'su 'one unit'
13. su'ko'shi 'a small quantity'
14. bo'kuma'chi 'we'
15. fu'ku 'clothing'
16. ki'mo 'mood'
17. ha'shi 'chopsticks'
18. ga'kusei 'student'
19. ha'shi 'bridge'
20. fu'ku 'blow'
21. su'gi ru 'exeed'
22. su'ginu 'newspaper'
23. qito 'certainly'
24. ku'shi 'a comb'
25. su'ki 'pleasing'
26. wa'taku'shi 'I'
27. su'shi 'sushi'
28. su'mi 'ink stick'
29. qi'kima'shi.ta 'pulled'
30. qi'hi 'father'
31. i'chi 'one'
32. usagi 'rabbit'
33. ku'tsu'shi.ta 'socks'
34. ga'kasa'shi.wu 'basement'
35. ka'bu.ki 'kabuki (theater)'
36. ke'kuta'i 'necktie'
37. ga'kata'esu 'subway'
38. su'pu'u 'spoon'
39. ka'kita '-style of writing'
40. ito'ko 'cousin'

*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 1990:171ff.)
Spanish. Below are data for nine “different” Spanish sounds. Be able to
give full articulatory descriptions of each and to locate each on the conso-
nant chart: [b], [p], [β], [t], [d], [g], [k], [g], [γ].

1. bóosa...........wedding 11. koβixa...........blanket 21. fálda.............skirt
2. takito...........little taco 12. úpa.............grape 22. milagro...........miracle
3. sébo.............fat 13. pápa.............Pope 23. dónde...........where
4. súpa.............soup 14. kasa.............house 24. aña..............given
5. péso.............weight 15. biero.............donkey 25. bóoa.............wedding
6. béso.............kiss 16. ábre...............bird 26. kúpo..............cube
7. ustéš..........you 17. míça.............crumb 27. dormiño...........slept
8. pyédra...........rock 18. óggo...........mushroom 28. lágo..............wolf
9. tibería...........liberty 19. gobernár...........govern 29. áγa..............I do
10. bóga.............vogue 20. gáta.............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] [ʃ] [z]

1. satan..........division 8. šeke.............world 15. čagza.............business
2. sæk..........color 9. šekum.............taxes 16. inza.............greetings
3. sær.............new 10. šesušil*...........washroom 17. inzewća...........publisher
4. sosal...........novel 11. šihap.............game 18. pączak...........cushion
5. su.............number 12. šiktāg...........dining room 19. pńuzok...........custom
6. sul.............wine 13. šilsu*...........mistake 20. umzıkšam...........restaurant
7. susul...........operation 14. šinpu.............bride 21. yęgzucug...........receipt

How many phonemes do these sounds represent?
Describe them fully.
What phonological generalization can be made about these sounds?
Lushootseed (Skagit; Salishan) Phonemes

<table>
<thead>
<tr>
<th>Stops</th>
<th>[vl]</th>
<th>p</th>
<th>t</th>
<th>c</th>
<th>k</th>
<th>kʷ</th>
<th>q</th>
<th>q²</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[glot]</td>
<td>ź</td>
<td>ţ</td>
<td>ĉ</td>
<td>ĉ</td>
<td>ĉ</td>
<td>k</td>
<td>kʷ</td>
<td>ĕ</td>
<td>q²</td>
</tr>
<tr>
<td>[vd]</td>
<td>b</td>
<td>d</td>
<td>j</td>
<td>j</td>
<td>j</td>
<td>(g)³</td>
<td>g²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fricatives</td>
<td>[vl]</td>
<td>s</td>
<td>ŏ</td>
<td>ţ</td>
<td>x²</td>
<td>x</td>
<td>x²</td>
<td>h</td>
<td></td>
</tr>
<tr>
<td>Resonants</td>
<td>[vd]</td>
<td>w</td>
<td>y</td>
<td>l</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[glot]</td>
<td>ŭ</td>
<td>ŭ</td>
<td>ŭ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal</td>
<td>[glot]</td>
<td>(m³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Vowels | (high)⁵ | i | u |
|         | (mid)⁷   | ø |   |
|         | (low)     | ø |   |

1. /c/ and /j/ represent the alveolar affricates [č] and [čj], respectively.

2. /š/ represents [š'], a voiceless ejective (rather palatalized) lateral affricate; there is no corresponding plain or voiced lateral affricate.

3. Occurs in one root only, /gádágad/ ‘tickle’.

4. Occurs in one root only, /ámíṉaʔd/ ‘small’. Puget Salish is one of very few languages (three of which – Quileute, Nootka, 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 germinates. Thus, /hiit/ ‘(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 /x/’s). Thus the interrogative predicate /?axída/ ‘(be) how?’ is pronounced [ˈaːxéːd].

7. There are three phonologically distinct schwas. Stressed [ə] always represents the segmental phoneme /a/ in its own right, but an unstressed [ə] might be /ə/, or an unstressed allophone of the phoneme /ə/, or the result of epenthetic cluster reduction.
Proto-Indo-European Numerals

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

<table>
<thead>
<tr>
<th>PIE</th>
<th>Skt</th>
<th>Gk</th>
<th>Lat</th>
<th>Goth'</th>
<th>Ofr</th>
<th>Hung</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 *oykos, *oynos</td>
<td>ekas</td>
<td>heis</td>
<td>unus</td>
<td>ains</td>
<td>oín</td>
<td>egy</td>
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<td>dūō</td>
<td>duo</td>
<td>twai</td>
<td>da</td>
<td>kettō</td>
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<td>treís</td>
<td>trés</td>
<td>þreis</td>
<td>tri</td>
<td>hárōm</td>
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<td>téttares</td>
<td>quattuor</td>
<td>fidwor</td>
<td>cethir</td>
<td>négy</td>
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<td>5 *peηkwe</td>
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<td>pénte</td>
<td>quinque</td>
<td>firmf</td>
<td>cóic</td>
<td>ōt</td>
</tr>
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<td>héx</td>
<td>sex</td>
<td>saihs</td>
<td>sē</td>
<td>hat</td>
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<tr>
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<td>m</td>
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<td>heptā</td>
<td>septem</td>
<td>sibun</td>
<td>secht n-</td>
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<td>oktō</td>
<td>ocīō</td>
<td>ahtau</td>
<td>ocht n-</td>
<td>nyolec</td>
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<tr>
<td>9 *newm</td>
<td>nāva</td>
<td>ennēa</td>
<td>novem</td>
<td>niun</td>
<td>noī n-</td>
<td>kilenc</td>
</tr>
<tr>
<td>10 *de-km</td>
<td>dáśa</td>
<td>déka</td>
<td>decem</td>
<td>taihun</td>
<td>deich n-</td>
<td>tíz</td>
</tr>
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</table>

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

1. ā → ē  [naːmə] → [neːm]  'name'
2. æː → ē  [bræːken] → [breːk]  'break'
3. ē → ĩ  [geːs] → [giːs]  'geese'
4. ĵ → ay  [miːs] → [mays]  'mice'
5. ɔ → ơ  [broːken] → [broːk]  'broke'
6. ơ → ū  [goːs] → [guːs]  'goose'
7. ū → aw  [muːs] → [maws]  'mouse'
The Northern Cities Chain Shift
The data consists of Sanskrit words in the Nagari writing system. The transcriptions are essentially phonemic. Identify the graphemes and their allophones. Describe the general structure of the writing system.