4. Morphological Analysis: MORPHEMES and ALLOMORPHY

Charles Philipon
4.1. Introduction

So far: By segmenting wholes (word forms) we got parts, called MORPHS, and we distinguished several ways of classifying these morphs.

Further, we developed a taxonomy of the forms, called EXPONENTS, available to languages (their speakers, that is) to express the terms of morphological categories.

But there is more to morphology.

For one thing, there are too many morphs. If we were to list them, in the “morphicon” of a language, we would find many of them so similar to others, in form and meaning/grammar, that we would like to recognise them as next-of-kin and, in some basic sense, perhaps one and the same. This is why we introduce the concept of MORPHEME: an abstract unit in linguistic systems (which could be collected in the “morphemicon” of a language) which subsumes several MORPHS, which are the concrete units occurring in speech.
But it is only in very special circumstances that this move of unifying morphs as realisations of one and the same morpheme – as ALLOMORPHS of that morpheme – is a sensible one.

Linguistic systems are crucially defined through contrasts, so it does make a huge difference whether forms actually can and do contrast or can’t/don’t: the special conditions which need to be met for (concrete) morphs to be seen as realisations of one (abstract) morpheme are to do with the distribution of these forms.

Forms can only contrast when one form occurs where the other form could occur too; forms cannot contrast when they are in complementary distribution: where one form occurs, the other form doesn’t, and vice versa. (Same story as with ALLOPHONES of PHONEMES.)

Differing forms which are unable to contrast must be considered the same, system-wise.

To illustrate allomorphy, let us examine the exponents for the PLURAL number in English.
geese fish

M. C. Escher, Sky and Water I
http://www.rockjwalker.com/
4.2. Illustration

English: PLURAL (‘more than 1 of’, also ‘zero or less’, not to mention ‘0.5’ etc.; SINGULAR = ‘(precisely) 1 of’).

Here’s a comprehensive survey of how to express PLURAL, with a few representative examples.

<table>
<thead>
<tr>
<th>Exponent:</th>
<th>Example</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>/s/</td>
<td>These cat-s sit on the mat</td>
<td>These cat-s sit on the mat</td>
</tr>
<tr>
<td>/z/</td>
<td>These dog-s</td>
<td>These kangaroo-s/ These small one-s</td>
</tr>
<tr>
<td>/iz/</td>
<td>These fox-es</td>
<td>These ox-en</td>
</tr>
<tr>
<td>/aʊ/ → /aɪ/</td>
<td>These mice</td>
<td>These geese</td>
</tr>
<tr>
<td>/ɪ/</td>
<td>These women</td>
<td>These men</td>
</tr>
<tr>
<td>/æ/ → /e/</td>
<td>These men</td>
<td>These men</td>
</tr>
</tbody>
</table>
These brethren /æ/ → /e/, /ən/
These sheep Ø
These deer, moose, elk Ø
These swine [= term of abuse for persons] Ø
These policemen Ø
These counsel always disagree Ø
These aircraft land on the mat Ø
These series are non-finite Ø
These Swiss sit on the mat Ø
The poor Ø
Mine sit on the mat Ø
Yours Ø
My aunt’s Ø
Who Ø
You Ø

These /is/ → /iz/
Those /æt/ → /əuz/

We I → we
Our sheep my → our
And there are some further exponents in the case of non-native words, e.g. *antenn-ae, strat-a, indic-es, cact-i, cherub-im,* ...

Thus, there is not a single exponent of PLURAL in English, but several of them, exemplifying at least four types of exponents (segmental-additive, segmental stem-modification, suppletion, zero).
Nonetheless, in some deeper sense one would like to see them as really being one and the same. After all, in addition to having the same meaning, they are the same in the grammatical system of English insofar as they never contrast with each other.

In phonology, phones (segments) which are phonologically similar and which don’t contrast (because they are in complementary distribution) are considered allophones of one phoneme. To be two different phonemes, i.e., to be meaning-distinguishing, you need to be able to contrast.

Analogously, in morphology, different morphs (the actually occurring forms) are considered allomorphs of one morpheme (an abstract entity) on the same systematic grounds:

- Morphs are allomorphs of one morpheme
  - if they contribute the same meaning to the constructions they are part of and
  - if they are in complementary distribution (hence cannot contrast).
Clark Kent (left), Superman (right), 1934–35: Have they ever been seen together?

http://www.logodesignlove.com/superman-symbol-evolution
Most examples below are instances of exponentence (in particular, **affix** allomorphy; but base (**stem**) morphemes can, and do, also have allomorphs – for example:

- *receive* [sɪv] ~ *recep* [sɛp] (as in *recep-tion*),
- *autumn* [ɔtəm] ~ *autumn* [ɔtəm] (as in *autumn-al*),
- *suspend* [səs'pend] ~ *suspens* [səs'pens] (as in *suspens-ion*),
- *south* [sɔθ] ~ *south* [səθ] (as in *south-ern*),
- *sane* [sɛm] ~ *san* [sæn] (as in *san-ity*),
- *knife* [nɑːf] ~ *knife* [nɑɪv] (as in *knife-s* [nɑɪvz]), etc.

**Exercise:**

Try to find examples of stem allomorphy from languages other than English, including
(i) your own, (ii) Turkish, (iii) Mandarin Chinese.
Note that forms may well have the same meaning without being in complementary distribution. Being in complementary distribution is something special.

Consider the suffixes -lein and -chen in German. They both express ‘diminution’ – smallness and/or endearment, and can alternatively be added to nouns:

*Tisch-lein/-chen, Häus-lein/-chen, Kätz-lein/-chen, Vög(el)-lein/-chen, Kind-lein/-chen, Füß-lein/-chen, usw.*

Some speakers may have their individual preferences; or across speakers some nouns may have a slight preference for either -lein or -chen, or one or the other may occur more frequently than the other with certain nouns (or in special uses: for example, in the biological sense of ‘male/female of a species’ only -chen is used – Männ-chen, Weib-chen).

But essentially the synonymous suffixes -lein and -chen are in free variation.
Well, upon a closer look, there are certain phonological and lexical contexts where either one or the other is avoided (for particular reasons), which effectively amounts to being in complementary distribution in these contexts.

Thus, with a noun such as *Seele ‘soul’, *-lein is avoided (*Seel-chen, *Seele-lein), because owing to geminates being simplified in German, *Seel-lein would be indistinguishable from *See-lein ‘little lake’.

The other way round, with nouns such as *Kelch ‘chalice’, *-chen is avoided (*Kelch-lein, *Kelch-chen), because the reduction of geminate /çç/ to singleton /ç/ could likewise cause lexical confusion (with *Kelch-chen sounding like *Kell-chen).
What about abstract-noun-forming suffixes -ness and -ity in English? Are they allomorphs on the grounds of being in complementary distribution?

No: with many nouns both can occur – hence again free variation:

e.g.  
*stupid-ity, stupid-ness; odd-ity, odd-ness; dens-ity, dense-ness;  
*rar-ity, rare-ness; scarc-ity, scarce-ness; pervers-ity, perverse-ness;  
feroc-ity, ferocious-ness; ...

But not with all nouns – where -ness is possible but -ity isn't!

e.g.  
*happi-ness, *happ-ity; clever-ness, *clever-ity; great-ness, *great-ity

Thus, there would seem to be more going on than just either complementary distribution or free variation. Such cases need closer scrutiny. Will have to wait for Morphology II.
For discussion.

1. Are /-z/ and /-ən/ (plus change of stem vowel /ʌ/ → /e/) allomorphs of PLURAL in this sense?

Well, for the noun brother two plurals are possible, brother-/z/ and brethr-/ən/.
That is, the distribution is not wholly complementary, because with this particular noun the
two exponents, on the face of it, do not mutually exclude one another.
Arguably, however, there are two different nouns in English, brother₁ ‘male sibling’ and
brother₂ ‘fellow member of a religious society, such as the Quakers’, differing not only in
meaning but also in their plural exponents.

2. Are /-ɪz, -z, -s/ and /Ø/ (= zero) allomorphs of PLURAL in this sense?

Well, quite a lot of nouns denoting certain animals can have a regular /-ɪz, -z, -s/ or a zero
plural, e.g. lion, elephant, partridge.
Again, I would argue that there is a semantic difference insofar as these animals can be
categorised as regular wild animals (with regular plural, /-ɪz, -z, -s/) or as GAME animals
(where the plural is zero).
Thus, in neither case would there be a contrast specifically due to the different plural exponents; the contrasts would be ones of the nouns themselves, or of the semantic categories they can be used to express.

http://freepages.genealogy.rootsweb.ancestry.com/~shep/cemeteries/brethren_map.png

Richard Ansdell, Shooting Partridge (!) over Dogs (!)
http://www.kunstkopie.de/a/ansdell-richard/shooting-partridge-over-d.html
4.3. Three major issues in allomorphy:

- the kinds of *conditions* on allomorphy;
- the kinds of allomorphic *alternations* themselves;
- the *distance* between condition and the allomorphy conditioned.
4.4. Conditions

First, the possible kinds of CONDITIONS for the choice of allomorphs are the following, illustrated from the PLURAL in English:

- **phonological**
  
in the case of /s ~ z ~ ɬz/:
  
Is the segment immediately preceding the PLURAL exponent a sibilant (then /ɬz/) or else voiced (then /z/) or voiceless (then /s/)?

- **morphological**
  
in cases such as /nɑɪf ~ nɑɪv/ <knife> or /hɔːs ~ hɔːɬ/ <house> the allomorphy of the stem is conditioned by the morphological category PLURAL;

it’s not phonological conditioning, because with following /s ~ z ~ ɬz/ which is not an exponent of PLURAL, but of GENITIVE or represents the copula *is* (short form), the stem-final segments remain voiceless (*knife’s* [nɑɪfs], *house’s* [hɔːsɬ]).
• **semantic**

  in the case of /Ø/:

  cf. *the deer/grouse/partridge/pheasant are over there*

  that is: when an animal is categorised as GAME, the PLURAL exponent is /Ø/ (especially in the register of game hunting, also of photo safaris)

• **lexical**

  in the cases of /ən ~ aʊ→aɪ ~ uː→iː ~ æ→e ~ u→i ~ Ø ~ I→we:/

  “lexical” conditioning means you have to know the particular lexical item which selects that particular allomorph – which is the worst possible case from the point of view of a learner: with all the other kinds of conditioning (phonological, morphological, semantic) the conditions play a role in the grammar independently, while in the case of lexical conditioning no independently needed property of items in construction with allomorphs can be drawn on.
Note: **policeman**, **policemen** are only orthographically distinct, but not phonologically: 
/pəˈliːsmən/;

the PLURAL allomorph is /Ø/, showing that zero is not only semantically conditioned, in the case of game animals, but also lexically conditioned, in cases such as **sheep** (not game!), **policeman**, **aircraft**, **you**, **mine** etc.

Homework problem:
Clearly, not all zero plurals can be accounted for as being semantically conditioned: many zero-plural forms do **not** refer to game. Can you find other **generalisations** about zero plurals, or does every single form with a zero plural really need to be lexically specified?
Lexical conditioning gives rise to what is known as INFLECTION CLASSES (more than one set of inflections for one and the same word class), a complication fortunately not encountered in all languages.

Modern English is not so strongly affected either: very little for nouns, but verbs have more – “strong” and “weak” verbs and a few further lexical verb classes.

Homework

Sort out the regular (“weak”) PAST TENSE allomorphs in English (in the same way we've done this for PLURAL above) and identify the conditions under which they are selected.

The regular suffixal PAST seems analogous insofar as there are three suffix variants, with or without a vowel ([id] vs. [d], [t]), with a voiced or voiceless final consonant ([id], [d] vs. [t]), distributed along what may seem the same lines as [iz], [z], and [s] for PLURAL (or also 3SG.PRES.IND and GEN).

The problem consists in [t] having a partly wider, but partly also a narrower, distribution than one would expect on the analogy of [s], and in also being tied up with vocalic and consonantal stem alternations.

Consider, for example, these weak verbs:

(i)   spell – spelt (also spelled), dwell – dwelt (also dwelled),
      burn – burnt, learn – learnt (also learned), smell – smelt (also smelted),
      spill – spilt (also spilled), spoil – spoilt (also spoilt)

(ii.a) mean – meant, dream – dreamt (also dreamed), deal – dealt, feel – felt,
      kneel – knelt
(ii.b) keep – kept, sleep – slept, creep – crept, sweep – swept, weep – wept, leap – leapt (also leaped)

(iii) cleave – cleft, leave – left

(iv) flee – fled

(v.a) meet – met, bite – bit, shoot – shot, light – lit (also lighted)

(v.b) hide – hid, feed – fed, lead – led, speed – sped (also speeded), slide – slid


(vi.b) bid – bid (also bade), spread – spread

(vii) bend – bent (*bended), send – sent, lend – lent, spend – spent, build – built, gild – gilt (also gilded)

(viii) go – went (wend-t, cf. he wended his way)
4.5. Nature of alternation

On to allomorphic alternations: they can be either of a phonological or a non-phonological kind.

Phonological alternations are ones which the phonology of a language can be held responsible for, and not the morphology alone.

That sounds trivial, but there is a lot of discussion of the area known as MOR(PHO)PHONOLOGY, which suggests it is potentially non-trivial.

The English PLURAL will again serve for illustration.
However, we could equally illustrate the same points with

- the 3rd PERSON SINGULAR INDICATIVE PRESENT of verbs (e.g., *kisses, comes, sits*),
- the GENITIVE of nouns and other possible hosts of genitive marking (e.g., *fox’s, dog’s, cat’s; the man over there’s hat*),
- the atonic short forms of *his* and *is* and possibly also of *has*, that is of
- the possessive pronoun of 3rd PERSON SINGULAR MASCULINE,
- the 3rd PERSON SINGULAR INDICATIVE PRESENT of the copula verb BE (*the fox’s over there, the dog’s here, the cat’s on the mat*),
- the 3rd PERSON SINGULAR INDICATIVE PRESENT of the auxiliary HAVE (*the dog’s eaten it*).

**Homework (optional):**

Investigate the allomorphy of further -s exponents, namely those of
(i) the adverbializing suffix -s (e.g., *unaware-s, eastward-s, whence*) and
(ii) of the hypocoristic suffix -s on shortened personal names (e.g., *Bailey > Bails*).
The three phonologically conditioned allomorphs of PLURAL, /s ~ z ~ ɪz/, are phonologically very similar to each other – so similar that you’d like to hold English phonology responsible for the alternation:

the final consonants involved only differ in voicing, and the only other difference is the presence or absence of an unstressed syllabic vowel: voicing or devoicing assimilations and unstressed vowel epenthesis or deletion between certain consonants is something phonological rules are known to be able to do.

The alternation between any member of this set and any other PLURAL allomorph, /ən/, /Ø/ etc., can hardly be blamed on English phonology, however:

changing a sibilant into a nasal or zero, or vice versa, would be extraordinary things to do for phonological rules.

(Actually, deleting a sibilant in a particular environment, namely after an identical sibilant in an unstressed syllable, would be doable for phonology – and arguably is done in English: try to pluralise Greek names such as Socrates. The two Socrateses??? Same for species etc.)
To give another example, from outside English. In Bolivian Quechua, PLURAL has two allomorphs, -*kuna* and -*s* (the latter a Spanish loan). The choice between them is conditioned phonologically (but there is also considerable influence from Spanish):

- *kuna* after consonant
- *s* after vowel

Thus:  
- *qan-kuna* you-PL  
- *yan-kuna* path-PL  
- *atoq-kuna* fox-PL

- *rumi-s* stone-PL  
- *wasi-s* house-PL

But they are phonologically very dissimilar (little wonder: coming from different languages).

(Source: Pieter Muysken.)

Now, how to deal with phonological alternations?
If an alternation between allomorphs is phonological, you miss out on the phonological similarity if you simply **list** the actual forms of the allomorphs, with their conditioning environments, as follows:

1. -ɪz / sibilant __
2. -z / voiced __
3. -s / voiceless __

**Anything** can be listed, however dissimilar.

If English **PLURAL** had these allomorphs, they could be listed just as well:

1. -ʃuː / sibilant __
2. -ðəm / voiced __
3. -lɔtlɔt / voiceless __

In a mere listing, the entries on the list are essentially unrelated; nothing inherently unites them; all they share is that they are on the same list.
However, notice that a list is **ordered sequentially**: one entry comes after another. In the listing of /-ɪz/, /-z/, /-s/ above this sequence matters, insofar as it helps us to identify the respective environments of the three allomorphs *economically*. To really specify the three environments accurately, one extra factor would have to be added to two of the allomorphs:

- /-ɪz/ / sibilant __
- /-z/ / **non-sibilant** voiced __
- /-s/ / **non-sibilant** voiceless __

That is, /-z/ is not used after **every** voiced segment, nor /-z/ after **every** voiceless one: sibilants, regardless of voiced or voiceless, select /-ɪz/. 
The sequence of the listing above, with the **most specific** environment (after sibilant) named **first**, automatically takes care of this, without requiring two extra mentions of the complementary environment (after non-sibilant), on the understanding that an “elsewhere” or an “otherwise” is added after each statement of an allomorph selection:

1. -іz / sibilant __ 

   otherwise

2. -z / voiced __

3. -s / voiceless __

**Homework:**

Try out different orders of these allomorph selection statements. How do they compare to the one given above in terms of economy of environmental specifications?
Now, to account for the phonological similarity of allomorphs insightfully the most natural solution is to relate them to each other by phonological rules.

As usual, in the case at hand, various solutions are possible, that equally account for the facts. Often, alternative solutions do not account for the relevant facts with equal economy or with equal elegance; or there are further facts which are automatically also accounted for by one of the solutions, though not by the others. I’ll only give one solution here, and you are invited to find and evaluate alternatives.

To account for the three phonologically similar allomorphs of PLURAL, I assume there is, in terms of the morphological system, a single form – an abstract phonological form, whose realisation requires the application of certain phonological rules. I assume this abstract form is like one of the surface realisations, namely the syllabic one, /-IZ/.

(In order not to complicate matters at this introductory stage, we won’t consider here the possibility of setting up underlying, abstract forms distinct from any of the alternative concrete surface forms – forms, for instance, which are not fully specified as to all the phonological features of all their segments.)
This requires two phonological rules, one (No. 1) deleting the vowel of the suffix except after a sibilant, the other (No. 2) assimilating the sibilant, assumed to be underlingly voiced, to a voiceless segment preceding it.

Thus:

<table>
<thead>
<tr>
<th>Basic forms</th>
<th>Basic forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ fɔks-iz</td>
<td>/ dog-iz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phonons</th>
<th>Phonons</th>
<th>Phonons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>dɔgz</td>
<td>kætz</td>
<td>—</td>
</tr>
<tr>
<td>kæts</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual forms</th>
<th>Actual forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ fɔksiz</td>
<td>dɔgz</td>
</tr>
</tbody>
</table>

In order to be able to come up with workable alternative solutions and to evaluate them, consider these questions:

- Are the two phonological rules given **sequentially ordered**?
  What would be the actual forms if the two rules were to apply in a different order?

- Could one also assume /-z/ oder /-s/, rather than /-iz/, as the **abstract** forms?
  What phonological rules would you need to derive the actual forms from such basic forms? How would these rules have to be ordered?

- What are considerations that might favour one solution over others?
If we assume the underlying form is voiceless /s/, there is an obvious problem with *foxes*:

| basic forms     | / fɔks-s dɔg-s kæt-s edʒ-s /
| assimilation    |  — dɔgz — edʒ
| vowel insertion | fɔksis — — edʒiz
| actual forms    | [ *fɔksis dɔgz kæts edʒiz ]

Applying vowel insertion before voice assimilation doesn’t help; it makes matters worse because now *edges* comes out wrong, too:

| basic forms     | / fɔks-s dɔg-s kæt-s edʒ-s /
| vowel insertion | fɔksis — — edʒis
| assimilation    |  — dɔgz — —
| actual forms    | [ *fɔksis dɔgz kæts *edʒis ]
Assuming underlying voiced /z/, things work out fine, as long as the vowel is inserted between sibilants before voice assimilation between neighbouring consonants:

| basic forms | / fɔks-z  dɔg-z  kæt-z  edʒ-z / |
| vowel insertion | fɔksIz  —  —  edʒIz |
| assimilation | —  —  kæts  — |
| actual forms | [ fɔksIz  dɔgz  kæts  edʒIz ] |
4.6. Distance

There is a further issue in allomorphy, which I will only mention here, postponing serious discussion to Morphology II:
Can allomorphy be conditioned at a morphological distance or only locally?

For example, *lion*, ending in a voiced non-sibilant, requires the PLURAL allomorph /-z/ (or /Ø/ if categorised as game). Now, what about *lion-ness*? What determines the choice of the plural allomorph here — the distant stem *lion* or the neighbouring suffix -*ness*?
Answer: The latter, hence *lion-ness*-/*z*/.

Could English, or other languages, also have allomorphy whose conditioning (especially if non-phonological) works differently, namely at a distance?

Though non-local conditioning would seem to be rare anywhere, it is in principle possible – especially if the conditioning is not phonological.
A possible example. Dutch (Germanic, IE) has several allomorphs of a suffix deriving nouns for females from nouns for males associated with some typical thing, place, characteristic etc., including -ster, -e, and -es.

The choice between them is not conditioned phonologically (but lexically, morphologically, and/or semantically).

The male suffix takes various forms, too, including -ier and -(en)aar, also conditioned non-phonologically.

The word plan has stems followed by male suffix followed by female suffix.

Compare these examples:

<table>
<thead>
<tr>
<th>Stem-Male-Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) a. herberg-ier-ster</td>
</tr>
<tr>
<td>tuin-ier-ster</td>
</tr>
<tr>
<td>b. schol-ier-e</td>
</tr>
<tr>
<td>passag-ier-e</td>
</tr>
<tr>
<td>(ii) a. bochel-aar-ster</td>
</tr>
<tr>
<td>mol-enaar-ster</td>
</tr>
<tr>
<td>b. kunst-enaar-es</td>
</tr>
<tr>
<td>zond-ar-es</td>
</tr>
</tbody>
</table>
By comparing (i.a) and (ii.a) one can conclude that female -ster is compatible with both male -ier and -(en)aar as its immediate (left) neighbours.

By comparing (i.a) and (i.b) one can conclude that male -ier is compatible with both female -ster and and -e as its immediate (right) neighbours.

By comparing (ii.a) and (ii.b) one can conclude that male -(en)aar is compatible with both female -ster and and -es as its immediate (right) neighbours.

Overall, therefore, one would conclude that the choice between female -ster, -e, and -es is conditioned at a distance – that is, not by the adjacent male suffixes, but by the stems. (Although on the evidence of the data given here, one would have to admit some local negative conditioning, insofar as female -e does not seem to occur after adjacent male -(en)aar, nor female -es after adjacent male -ier.)

(Source: Ultimately Geert Booij, I think.)

More on distant conditioning in Morphology II.
**Action at a Distance**

unknown process pushes charged particle away from magnet

under particle theory, force carrier (photon) transfers momentum directly to charged particle

http://abyss.uoregon.edu/~js/images/action_at_a_distance.gif
### 4.7. The phenomenology of allomorphy, summarised

<table>
<thead>
<tr>
<th>conditioning</th>
<th>alternation</th>
<th>distance</th>
<th>examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>phonological</td>
<td>phonological</td>
<td>local</td>
<td>Engl. PL / -s ~ -z ~ -iz /</td>
</tr>
<tr>
<td>non-phonological</td>
<td>local</td>
<td></td>
<td>Quechua PL after V/C -s ~ -kuna</td>
</tr>
<tr>
<td>morphological</td>
<td>phonological</td>
<td>local</td>
<td>Engl. SG/PL stem /naıf ~ naıv/</td>
</tr>
<tr>
<td>non-phonological</td>
<td>local</td>
<td></td>
<td>Engl. PRES/PAST stem go ~ wend-t</td>
</tr>
<tr>
<td>semantic</td>
<td>phonological</td>
<td></td>
<td>—— ?</td>
</tr>
<tr>
<td>non-phonological</td>
<td>local</td>
<td></td>
<td>Engl. “game” PL / Ø ~ .../</td>
</tr>
<tr>
<td>lexical</td>
<td>phonological</td>
<td>local</td>
<td>Engl. PAST send-t ~ end-ed [?]</td>
</tr>
<tr>
<td>non-phonological</td>
<td>local</td>
<td></td>
<td>Engl. PL / -ən ~ ... /</td>
</tr>
<tr>
<td>non-phonological</td>
<td>distant</td>
<td></td>
<td>Dutch FEMALE /-ster ~ -e ~ -es /</td>
</tr>
</tbody>
</table>
Find more examples of each, from English or other languages.

Also, almost all examples in the table involve local conditioning; find further examples of distant conditioning, if you can. (And don't despair if you can't.)
4.8. Postscript

Allomorphy complicates morphology, no doubt about it. Why does something so complicated exist, then, and how does it come about? Good questions. Any (good) answers?