Speech perception in phonology

Perceptual mechanisms of sound change
- Phoneme restoration
- Compensation for coarticulation

Hypo-correction
- Redundancy shift

Hyper-correction
Phonetic variation is a source of possible sound changes.

There are striking parallels between phonetic variation and common sound changes and synchronic sound alternations.

- Gestural hiding - deletion
- Gestural blending - assimilation
- Aerodynamic voicing constraint - devoicing
- Aerodynamic fricative constraint - glide formation
But phonetic variation is not the same as sound change.

“left watch” as [lɛfwaʃ]

does not result in sound change /ft/ > /f/

why?
Mechanisms opposing sound change:

- communication is disrupted by sound change
- social cohesiveness is obtained by phonetic conformity
- orthographic conventions tend to be standardized
- processes of perceptual compensation for variation
  phoneme restoration
  compensation for coarticulation
Phoneme restoration

Listen to a short noise burst.

Now listen to me say “legislation”.

Now we put the noise burst over part of the word.

1. What is the location of the noise?
2. Is the noise added to the word or did it replace part?
The noise replaces the [s] and also the voiceless part of the [l].

Did you “hear” the missing [s]?
Compensation for coarticulation.

Compare the nasality of the vowel in “bam” when you hear it with or without the [m] cut off.

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**Diagram:**
- Left side: Waveform of “bæm”
- Right side: Waveform of “bæ”
The presence of the nasal consonant makes the vowel sound less nasalized than when it is cut off.

This is a sort of *perceptual parsing* - the nasality of the vowel is attributed to the consonant instead of the vowel.

Listen to them again. bæm bæ

Which one seems to have the higher vowel?

This may be another case of perceptual compensation. The lower F1 during the nasalized vowel can be parsed as due to nasality when the /m/ is present, but may be parsed as an indication of greater vowel height when the /m/ is cut off.
Processes like phoneme restoration and compensation for coarticulation are perceptual “corrections”.

Articulation obscures phonemes and perception recovers them.

Two kinds of perceptual miscorrections are involved in sound change (Ohala, 1993).

Hypocorrection - Listener fails to compensate for context.

Hypercorrection - Listener overcompensates for context.
Hypo-correction. Listener fails to compensate for context.

talker  \( /\text{VN}/ > [\tilde{\text{VN}}] \quad /\text{VN}/ > [\tilde{\text{V}}(\text{N})] \)

listener  \([\tilde{\text{VN}}] > /\text{VN}/ \quad [\tilde{\text{V}}] > /\tilde{\text{V}}/ \)

Note here that articulatory slop - coarticulation on the vowel, and shortening of the nasal - provides input for the perceptual effect, but the actual change in the speaker’s intention (from /\text{VN}/ to /\tilde{\text{V}}/) is perceptual.
Redundancy shift

Hypocorrection may not be entirely perceptual.

• All phonological contrasts are cued redundantly.

e.g. $[\pm \text{voice}]$ is cued by both vocal fold vibration and by pitch on the following vowel
The effect of stop voicing on pitch in English. Pitch is higher after [p] than [b].

From Hombert, Ohala, and Ewan (1979).
Redundancy shift

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• All phonological contrasts are cued redundantly.

  e.g. [± voice] is cued by both vocal fold vibration and by pitch on the following vowel

• Redundant cues are under the speaker’s control.

  e.g. the [± voice] effect on pitch is much smaller in a tone language.
The effect of stop voicing on tonal pitch in Yoruba. The pitch perturbation caused by [± voice] is of much shorter duration than in English.

From Hombert, Ohala, and Ewan (1979)
Redundancy shift

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e.g. the \([\pm \text{ voice}]\) effect on pitch is much smaller in a tone language.

• Two cues for a phonological contrast may gradually shift roles (as in tonogenesis).

\[
\begin{array}{cccc}
\text{voicing} & \text{pitch} & > & \text{voicing} & \text{pitch} \\
(\text{primary}) & (\text{redundant}) & & (\text{redundant}) & (\text{primary})
\end{array}
\]
So, although hypo-correction is an “unintended failure of the perceptual process” (Ohala, 1993), redundancy shift may be gradual and set the stage for hypocorrection.
Hyper-correction

Listener over-compensates for the phonetic effects of context.

Slavic dissimilation

\[
\text{stoj- a } \rightarrow \text{stoj}a \quad \text{“stand”}
\]

the front vowel [a] is changed to a back vowel [o] in the context of a front glide [j].

This is a case of hyper-correction because the perceptual process of “compensation for coarticulation” attributes the frontness of the suffix to the glide and thus compensates - removes the frontness.
Many dissimilations have this appearance, and typically occur with phonetic properties that have an extended time-span.

Labialization: *pjam > pin “diminish” Cantonese

Glottalization: *t’ant’a > t’anta “bread” Quechua

Pharyngealization: *C[phar] V C[phar] Arabic
Another case of hyper-correction.

Perceptual metathesis (Blevins & Garrett, 1998).

akekaha? > agékʰaa? “my eye” Cayuga
aakihwaska > àakʰiwàska “I’m buying it” Cherokee

We suppose that /kah/ was realized something like [kʰa] or [kʰa] at an earlier stage, then the voicelessness of the vowel was reinterpreted (perceptually, via hyper-correction) as due to an initial aspirated stop /kʰa/.

Here are a couple of other examples from Slavic:

*orbota > robota “work” Polish
*olkǔtǐ > lákot “elbow” Bulgarian
Hypo-correction
  tonogenesis
  distinctive nasalization
  perceptual substitution (e.g. $w\theta \rightarrow w\varnothing$, “with”)

Hyper-correction
  dissimilation
  metathesis
An illustration of hypo- and hyper- correction.

Take recordings of “he” and “who”.

Filter them so that only the first formant is audible (500 Hz, lowpass filter).

Put them in a carrier phrase - which one has “he” and which has “who”? #1 or #2?

Do they both sound like [u] after filtering? If yes, this is an example of hypocorrection because you failed to compensate for the filter to “restore” the F2 of [i].
Now we play the filtered “he” and “who” in a filtered version of the carrier phrase.

Which one has “he” and which one has “who”? #1 or #2?

Do they both sound like [i]?

If so, this is a case of hyper-correction. The carrier tells your perceptual system about the filter so now you “restore” the F2 in both [u] and [i].