Feature Spreading in Sanskrit

*Internal sandhi* refers to the changes that sounds undergo when they come in contact with other sounds within a word. Most of these changes are examples of feature spreading or *assimilation*, when one sound takes on the features (voicing, aspiration, retroflexion, etc.) of another sound. Assimilation can be classified as *regressive* (right-to-left) or *progressive* (left-to-right).

The most important changes to remember are those that happen in *obstruent clusters*. Obstruents (*jhal*/*jhaL*) include all of the stop consonants (*sparśa*s) and sibilants (*ardhasparśa*s).

1  **Voicing assimilation**

[VOICED], indicating vibration of the vocal cords, is a LARYNGEAL feature. [SPREAD GLOTTIS] (here abbreviated [S.G.]), or aspiration, is also a LARYNGEAL feature. Such features tend to be linked and de-linked as a group.

In *external sandhi*, the final consonant of a word takes on the voice features of the following sound (whether that sound is a vowel or consonant). These processes belong to Sanskrit’s *postlexical* phonology.

In *internal sandhi*, the spread of [VOICED] is more limited. The general rule is regressive assimilation: obstruents will take on the voice features of a following obstruent. Example: *tyaj ‘abandon’ + ta:*

\[
(1) \quad t \quad y \quad a \quad j \quad - \quad t \quad a \\
\times \quad \times \quad \times \quad \times \quad \times
\]

Here the whole LARYNGEAL node of *j*, including the feature [VOICED], is delinked. The sound *j* then gets all of its laryngeal features from the following sound *t*. Since *t* has no laryngeal features (no voice, no aspiration), *j* becomes *c* (no voice, no aspiration). Before obstruents (*jhaL*), palatal sounds (*cu*) become velar sounds (*ku*). Hence *tyaj + ta* → *tyac + ta* → *tyak + ta*.

Practice with participle suffixes (*Kta*), stem-forming suffixes (future *sya* or desiderative *saN*), inflectional endings (*tiN*), etc.: *bhaj ‘partake,’ yuj ‘join,’ bhañj ‘break.’

2  **Aspiration assimilation**

[S.G.] spreads similar to [VOICED], but with some crucial differences.

• A single aspiration feature can be linked to multiple sounds, but aspiration only manifests *on a single sound* in pronunciation. This will always be the onset of a syllable (often the last sound in a consonant cluster).
• In clusters of stops, the direction of assimilation follows the aspiration. If the aspirate is first in a cluster, we get progressive assimilation; if it’s last, regressive.

The case of śak ‘help’ + dhi is similar to the regressive assimilation of voicing seen above:

\[ \text{(2)} \quad \begin{array}{cccc} \hat{s} & a & k & - \\ & \times & \times & \times \\ \text{[OBST]} & \text{[OBST]} & \downarrow \\ \text{LAR} & \text{LAR} \\ [ ] & [\text{VOICE}] & [\text{S.G.}] \end{array} \]

When the LARYNGEAL node of k is delinked, it gets its LARYNGEAL features from the following dh. Thus it becomes voiced and aspirated. However, while aspiration can be linked to several sounds, it can only ‘show up’ on one sound. Thus śak + dhi → šagh + dhi → šag + dhi. (NB this is not the Pāṇinian derivation).

Often, however, the aspirate comes first, and in such cases we have progressive rather than regressive assimilation of LARYNGEAL features ([S.G.] and [VOICE]). For example, labh ‘take’ + ta:

\[ \text{(3)} \quad \begin{array}{cccc} l & a & bh & - \\ & \times & \times & \times \\ \text{[OBST]} & \text{[OBST]} & \downarrow \\ \text{LAR} & \text{LAR} \\ [\text{VOICE}] & [\text{S.G.}] & [ ] \end{array} \]

Here the LARYNGEAL features of bh spread to the following sound t, which becomes voiced and aspirated. Again, since aspiration can only show up on one sound in a cluster, we get lab + dha instead of labh + dha. Progressive assimilation of laryngeal features is called Bartholomae’s Law.

Practice with participle suffixes (Kta and Ktavat), nomen agentis (tṛC), inflectional endings (tiN), etc.: rudh ‘stop,’ budh ‘awake,’ duh ‘milk,’ druh ‘harm,’ dah ‘burn,’ śudh ‘purify,’ sādh ‘accomplish’

NB: for some verbs (druh, duh), a final -h represents an older -gh and thus patterns with gh; for others (ruh), a final -h represents a *ẓh sound that Sanskrit no longer has, and results retroflexion and compensatory lengthening in the Kta-forms (e.g., ruh + ta → rūḍha). Bartholomae’s Law does not apply to forms of the root dhā ‘place.’

Before a sibilant, the general rule again takes effect: delink the aspirate sound’s LARYNGEAL features. In this case, however, the feature [S.G.] is ‘thrown back’ onto the first consonant of the root. (Alternatively, we can assume that the feature [S.G.] is linked to the whole root, but in normal circumstances it only appears on the last consonant; when the LARYNGEAL features of that last consonant are delinked, [S.G.] has no place to go except the first consonant.) This is called Grassmann’s Law. Grassmann’s Law applies only
to roots which have two voiced consonants, and only when the laryngeal features of the second consonant are completely delinked (e.g., not when they are linked to a following consonant, as in bodh + tavya → boddhavya). For example, dabh ‘harm’ + su (dibh before a desiderative suffix):

\[
\begin{array}{c}
\text{d} & i & \text{bh} & \text{s} & \text{u} \\
\times & \times & \times & \times & \\
\text{[OBST]} & \text{[OBST]} & \text{[OBST]} & \\
\text{LAR} & \text{[S.G.]} & \text{[VOICED]} & \\
\text{[VOICED]} & \text{[S.G.]} & \\
\end{array}
\]

Here the sound bh loses its laryngeal features before the sibilant s, and hence becomes unvoiced and unaspirated (p). But then the feature [s.g.] (re)appears on the first consonant of the root. Hence dabh + su → dibh + su → dip + su → dhip + su.

Practice with the future and desiderative suffixes (sya, saN): duh ‘milk,’ budh ‘awake,’ guh ‘conceal.’

Practice with the endings se, te, tas, thas of the root dhā ‘place’ (NB that Bartholomae’s Law does not apply).

3 Retroflex assimilation: Ruki

Retroflex features also spread within a word. Dental sounds alternate with their corresponding retroflex sounds (s/ʂ, n/ɳ, t/ʈ, th/ʈh, d/ɖ, dh/ɖh), hence I call these sounds retroflexible. But there are several different processes by which these sounds are actually retroflected.

One important case is where a palatal sibilant (ʃ), and in some cases a palatal stop (c, j) becomes a retroflex sibilant (ʂ) before another stop. If this following stop is retroflexible, then it is retroflected. E.g. viṣ + ta → viṣ + ta → viṣ + ʈa; srj + ta → srʃ + ta → srʃ + ʈa.

Ruki refers to the retroflexion of s by these sounds:

- R: ṛ, ṭ, r
- U: u, ū, o, au
- K: k
- I: i, ɨ, e, ai

When s immediately follows any one of these triggers, it becomes associated with the feature [HIGH] (in the TONGUE HEIGHT node). Thus ruki is a kind of progressive assimilation.
The combination of CORONAL (in the ARTICULATOR node) and [HIGH] (in the TONGUE HEIGHT node) is what makes retroflex sounds retroflex. Note that the target has to be a sibilant (with the feature STRIDENT) in order for the triggers to affect it. \( go + su \rightarrow go + \dot{s}u \).

The \textit{tisra-rule} is an exception to \textit{rukī}: in words like \textit{tisra}, \textit{usra}, etc., retroflexion of \( s \) is blocked by a following \( r \) (this is a ‘dissimilation’ effect).

4 \textbf{Retroflex assimilation: Nati}

\textbf{Nati} refers to the retroflexion of \( n \). The triggers for \textit{nati} are \( r, \ddot{r}, r, \) and \( \dot{s} \). Unlike \textit{rukī}, however, \textit{nati} can work at a distance. \textit{The retroflexion triggered by nati remains in effect until the end of the word is reached, or until it is blocked by a coronal plosive.} CORONAL includes palatal, retroflex and dental; PLOSIVE refers to stops (\textit{sparśas}). \textit{Nati} thus spreads retroflexion from a retroflex CONTINUANT rightwards towards a retroflexible (i.e., CORONAL) NASAL, but it stops when it encounters a PLOSIVE that is also CORONAL.

\begin{align*}
\begin{array}{c}
\times \times \times \times \times \times \times \\
[\text{CONT.}] \\
T.H. \\
[\text{HIGH}] \\
\end{array} \\
\begin{array}{c}
r \quad \ddot{a} \quad m \quad \dddot{a} \quad y \quad a \quad n \quad a \\
[r \ \ddot{a} \ m \ \dddot{a} \ y \ a \ n \ a] \\
[\text{NASAL}] \\
T.H. \\
[\text{HIGH}] \\
\end{array}
\end{align*}

Practice: \textit{tṛtīya ekavacana} and \textit{saṣṭhī bahuvacana} of \textit{gātra-} ‘limb,’ \textit{nakṣatra-} ‘constellation,’ \textit{rāṣṭra-} ‘kingdom,’ \textit{preman-} ‘love,’ \textit{arka-} ‘sun’; \textit{ātmanepada} participles of \textit{īkṣ ‘gaze,’ bhakṣ ‘eat.’}

NB: Retroflexion of \( s \) and \( n \) can sometimes can take place over the boundary between an \textit{upasarga} and a \textit{dhātu}. Roots like \textit{nam} which are retroflexible (\textit{parī-ṇam}) are taught with retroflexion in the \textit{dhātupāṭha} and are thus called \textit{ṇopadeśa}. 

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