

Phonology – synchronic and diachronic

	Velar/ glottal	Palatal	Labial	Retroflex	Dental		
	a ā	i ī	u ū	ṛ ṝ	ḷ (ḹ)		
		e ai	o au				
	(ṁ)	ḥ)					
velar/glottal	k	kh	g	gh	ṅ		h
palatal	c	ch	j	jh	ñ	y	ś
retroflex	ṭ	ṭh	ḍ	ḍh	ṇ	r	ṣ
dental	t	th	d	dh	n	l	s
labial	p	ph	b	bh	m	v	

Comments –

a and *ā* differ in height ([ʌ] or [ə] vs. [ā])

No qualitative distinction between long and short in *i*-vowels and *u*-vowels

r, *l* probably were [ʳᵃ], [ˡᵃ] in Vedic similar to Avest. *ərə*

e, *ai*, *o*, *au* are called diphthongs, although *e* and *o* are synchronically long monophthongs. The term diphthong is justified phonologically (*e* ~ *ay* like *ai* ~ *āy*)

m̐ (or *m̐*) “anusvāra” before stop is homorganic nasal; before [- stop] consonants it is a segment-length nasal transition (There is also *m̐̃*, mainly in Vedic, occurring under various conditions)

ḥ is a voiceless glottal fricative, differing from *h*, which is breathy voiced [ɦ]

k, *c*, etc. are unaspirated

The aspiration of *kh*, *ch*, etc. is stronger than in English or German, with some degree of turbulence

The aspiration of *gh*, *jh*, etc. is breathy-voiced

Palatal stops have a sibilant-like offglide but are not affricated (i.e. *c* is [c̠̪̥], not [tʃ̥])

Some transcribe *cch* (as in *gacchati* ‘goes’) with simple *ch*, but this ignores that *cch* is bisegmental; phonetically (*c*)*ch* and *cś* seem to be indistinguishable

r is classified with the retroflex consonants, but phonetically it was alveolar. The retroflex classification is based on phonological considerations (like *ṣ* it triggers “ṇatva”; but this can phonetically be accounted for by assuming that the trigger for *ṇatva* is [post-dental])

Modern pronunciation

m̐ (anusvāra) assimilates to following stops, is pronounced *m* in word-final position, and elsewhere varies between *n̐*, *m*, and *n* (there is also [β̐]) (*hamsa*)

ḥ (visarga) is generally pronounced as [ɦ] with a following short echo vowel (*aśvaḥ* [ašvaɦ^a] ‘horse’, *aśvaiḥ* [ašvaiɦⁱ] ‘with horses’)

ś and *ṣ* generally are not distinguished, pronounced as [š]

ṛ is pronounced as [ri] in the north, [ru] in the south

jñ is pronounced [gy] ± nasalization in the north, [dny] in (parts of) the south

(Bangla speakers tend to have a very different, Bangla-influenced pronunciation; e.g. *hamsa* [hɔŋʃɔ])

Synchronic phonology

Phonotactics

- With few exceptions (e.g. *titaü* ‘sieve’), vowel clusters are not permitted in simple words
- Initial consonant clusters normally do not exceed three
 - Initial clusters of three are rare, some contain an initial *s* + stop (as in *strī* ‘woman’, *styā-* ‘stiffen’, *spraṣṭavyam* ‘to be touched’), but initial *kṣṇ-* is also found (*kṣṇu-* ‘sharpen’, *kṣvid-/kṣvid-* ‘hum’, *kṣvel-* ‘play’).
 - Compounds may have heavier clusters (e.g. *stry-agāra* ‘women’s quarters’)
- Medial clusters can go up to five (e.g. *kārtsnya* ‘entirety’), but this is rare and only found in certain morphologically derived forms (*kārtsnya* from *kṛtsna* ‘whole, entire’)

- Except for rare exceptions with *-rt*, only singleton final consonants are permitted
- Permitted finals are: *k/g, t/ḏ, t/d, p/b* (or K, Ṭ, T, P), *ṇ, n, m*
 - no aspirated stops
 - no palatal stops
 - no *ṇ* or *ṇ* (except some onomatopoeia)
 - no sibilants
 - no semivowels
 - no *h*
- final *ṇ* morphophonemically from *ṇk*

- *jh* is rare, limited to onomatopoeia
- *ñ* only in clusters with palatal stops (or before sibilant)

Ablaut

- The base form of roots is ordinarily the weakest grade (e.g. *kṛ-* ‘do’, *kṛ-ta-* ‘(having been) done’)
- A fuller form of the root (as in *kar-tum* ‘to do’) is said to have GUṆA, which more or less corresponds to “Full Grade” in IE linguistics
 - In roots with syllabic *ṛ* (or *ḷ*), guṇa consists in the insertion of a short *a* and the liquid becomes nonsyllabic
 - In roots with *ĩ* or *ũ*, guṇa is *e* or *o*, alternating with *ay-* or *av-* before vowel (e.g. *nĩ-* ‘lead’: *ne-tum* ‘to lead INF’, *nay-a-ti* ‘leads PRS.3SG’)
- The strongest form (e.g. *a-kār-ṣ-īt* ‘has done AOR’, *kār-ay-a-ti* ‘causes to do’) is called VR̥DDHI and often corresponds to “Extended Grade”
 - Roots with syllabic *ṛ* (or *ḷ*) insert *ā* in vr̥ddhi and the liquid become nonsyllabic
 - In roots with *ĩ* or *ũ*, vr̥ddhi is *ai* or *au*, alternating with *āy-* or *āv-* before vowel (e.g. *nĩ-* ‘lead’: *a-nai-ṣ-īt* ‘has led AOR’, *nāy-ay-a-ti* ‘causes to lead’ PRS.3SG)

- Complications

- Roots in *am* or *an* drop their nasal before stop in their weakest form (e.g. *gam-* ‘to go’ : *ga-ta-* ‘(having) gone’)
- Some roots in final nasal show long vowels in their weakest form (e.g. *jan-* ‘be born’ : *jā-ta* ‘born’; *bhram-* ‘wander’ : *bhrān-ta-* ‘wandered’); these roots also typically have an *i* in their Guṇa when preceding a stop (e.g. *bhrami-tum* ‘to wander’)
- Roots ending in *ā* have *i* or *ī* in their weakest form (e.g. *sthā* ‘stand’ : *sthi-ta-* ‘(having) stood’)
- Some roots in *ṛ* have a long *īr* or *ūr* in their weakest form (e.g. *gir-* ‘praise’ : *gūr-ta* ‘praised’; these roots typically have an *i*-vowel when preceding a stop (e.g. *gari-tum* ‘to praise’)
- A technical term for roots that insert *i* is SET-ROOTS; other roots are called ANIṬ-ROOTS

Sandhi

The interaction between segments

Two types of sandhi

- Internal sandhi (sandhi within words)
- External sandhi (sandhi across word boundaries)

agníḥ pūrvebhir ṛṣibhir ídyo nūtanair utá sá devāṃ éhá vakṣati

agníḥ pūrvebhiḥ ṛṣi'bhiḥ ídyah nūtanaiḥ utá sáḥ devān ā ihá vakṣati

/agnis pūrvebhis ṛṣibhis ídyas nūtanais utá sá(s) devān ā ihá vakṣati/

‘Agni (has been invoked) by earlier ṛṣis and is to be invoked by present-day ones. He will bring the gods here.’ (RV 1.1.2)

jñātam etad bhavadbhir^r yaⁿ mam^aite putrā^h śāstravimukhā^h vivekarahitā^s ca
/jñātam etad bhavadbhis^s ya^d mam^aete putrā^s śāstravimukhā^s vivekarahitā^s
ca/

‘It is known by your honors that these sons of mine are averse to learning
and bereft of judgment.’ (Pañcatantra 1.4)

Internal sandhi

- Resolution of vowel hiatus
 - Like vowels contract to long vowels (e.g. *su-uk-ta-* → *sūkta* ‘well-spoken; hymn’)
 - *a*-vowel + *i*- or *u*-vowel → *e*, *o*. E.g. *-a-ī-* > *-e-* (thematic vowel + OPT)
This is mainly an external-sandhi phenomenon; but note compounds like *rāja-indra* → *rājendra* ‘Indra of kings; great king’
 - Glide formation: *ĩ, ũ* → *y, v* / ___ *V*; e.g. *vi-ā-karaṇa* → *vy-ā-karaṇa* ‘grammar’
 - Diphthong changes: *e, o* → *ay, av* / ___ *V*; *ai, au* → *āy, āv* / ___ *V*; e.g. *nī-* → *ne* by guṇa → *nay-a-ti* ‘leads’; *nī-* → *nai-* by vṛddhi → *nāy-ay-a-ti* ‘causes to lead’

- Consonant sandhi

– RUKI $s \rightarrow \text{ṣ} / \begin{matrix} \left[\begin{matrix} i, u \\ r \\ k \end{matrix} \right] ___ \end{matrix}$

(where i, u include $\bar{i}, \bar{u}, e, ai, o, au$, and r includes ṛ)

This works most regularly with suffixes, e.g. LOC PL *senā-su* ‘in the armies’ : *agni-ṣu* ‘in the fires’

- Final cluster simplification (with a few exceptions in the aorist and in root nouns in rC); e.g. *bhar-ant-s* ‘carrying NOM.SG.M’ $\rightarrow$ *bharan*
- $s, r \rightarrow \text{ḥ} / ___ \#\#$ (e.g. *aśva-s* $\rightarrow$ *aśvaḥ* ‘horse NOM.SG, *punar* $\rightarrow$ *punaḥ* ‘again’)
- Voice assimilation of stops to following obstruents): *sad-* ‘sit’ : *sattum* INF, *sat-sya-ti* FUT.3SG; *yug-* ‘yoke’ : *yok-tum* INF, *yok-ṣya-ti* FUT.3SG, *yuk-ta* TPPL

- “Bartholomae’s Law”: voiced aspirate + *t* → voiced unaspirate + *dh*
(In essence a transfer of voiced aspirate release from coda to onset position)

budh- ‘be aware, know’ : *bodh-tum* → *boddhum*, *budh-ta-* → *buddha-*

- Aspiration is lost word-finally and before sibilant; e.g. *-stubh* ‘praising’ → *-stup*; *labh-* ‘take’, FUT *lap-sya-ti*
- Aspirate “throwback”, if the root has an initial voiced stop and the final aspiration is lost

budh- : *bhot-sya-ti*; *-bhudh-s* → *-bhut* ‘knowing’ vs. *buddha*)

- Aspirate dissimilation (PRF *bi-bhed-a* ‘split’ from *bhid-*; but also note things like *sthā-* ‘stand’: PRF *ta-sthau*; i.e., there are more general rules that restrict the nature of the initial in reduplicated syllables) [Relic of Grassmann’s Law]

- Root-final *c* → *k* before obstruent and word-finally (*muc*- ‘release’ : *mok-tum*, *muk-ta-*, *mok-ṣya-ti*, *-muk* ‘releasing’. (A similar change occurs elsewhere, but not phonologically predictably; e.g. *moka*- ‘release; skinning of animal’ vs. *moca*- ‘exudation of tree sap’)

- The fate of *ṣ* and *ś* before obstruent (**merger**)

dviṣ- ‘hate’ : *dveṣtum*, *dviṣta*, /dveṣ-sya-ti/ *dvek-ṣya-ti*

drś- ‘see’ : *draṣtum*, *drṣta*-, /draś-sya-ti/ *drak-ṣya-ti*, /drś-s#/ -*drk* ‘seeing’

- Two types of *j*, *h* – palatalized original velar vs. original palatal

bhuj- ‘consume’ : *bhoktum*, *bhukta*, *bhok-ṣya-ti*; *dah-* ‘burn’ :
dagdhum, *dagdha*, *dhak-ṣya-ti*, -*dhak* ‘burning’

vs. *sṛj-* ‘release, create’ : *sraṣtum*, *sṛṣta*-, *srak-ṣya-ti*; *mih-* ‘make
water’ : *meḍhum*, *mīḍha*, *mek-ṣya-ti*

Some variation: *muh-* ‘be confused, confuse’ *mugdha* ~ *mūḍha*

Special developments include *sah-tum* → *soḍhum* ‘to endure’, *vah-tum*
→ *voḍhum* ‘to convey’

In many cases, cluster-interactions are avoided through the insertion of
the “euphonic” or “union” vowel -i- (*sah-* ‘endure’, FUT *sakṣyati* ~
sahiṣyati)

- Nasals assimilate to following stop (e.g. *gam-* : *gan-tum* ‘to go’); they change to anusvāra before sibilant and *h* (e.g. *man-* : *maṁ-sya-ti* ‘will think’)
- Gemination of stops next to sonorants, most common next to *r*, especially after *r*
E.g. *artha* ‘purpose’ → *arttha*; *atra* ‘here’ → *attra* (hence also inverse forms like *sattra* (/sad-tra/) ‘sitting, session’ ~ *satra*)

External sandhi

(Allen 1962, Emeneau & van Nooten 1968)

Vowel sandhi

1. $\check{V}_1 + \check{V}_1 \rightarrow \bar{V}_1$ (e.g. *indra atra* $\rightarrow$ *indrātra* ‘O Indra, here’)
2. $e, o + a \rightarrow e', o'$ (e.g. *adhiṣṭhāne atra* $\rightarrow$ *adhiṣṭhāne 'tra* ‘here at this location’) – “avagraha”
Thus also *-as* [aḥ] + *a* (e.g. *indraḥ atra* $\rightarrow$ *indro 'tra* ‘Indra here’)
3. $e, o + V$ (elsewhere) $\rightarrow a + V$ (*adhiṣṭhāne eva* $\rightarrow$ *adhiṣṭhāna eva* ‘at the location EMPH’)

Thus also *-as* [aḥ] + *V* (elsewhere)

indraḥ eva $\rightarrow$ *indra eva* ‘Indra EMPH’

indraḥ āste $\rightarrow$ *indra āste*, not **indrāste*!

contrast: *indra āste* $\rightarrow$ *indrāste* ‘O Indra, (somebody) is sitting’)

4. $ai + V \rightarrow \bar{a} + V$ (*tasmai eva* $\rightarrow$ *tasmā eva* ‘to him EMPH’)

Thus also $-\bar{a}s$ [$\bar{a}ḥ$] (*aśvāḥ atra* $\rightarrow$ *aśvā atra* ‘the horses here’)

$au + V \rightarrow \bar{a}v + V$ (*asau eva* $\rightarrow$ *asāv eva* ‘that one yonder EMPH’)

Note: 3 and 4 do not feed 1 (in good Sanskrit) – No “double sandhi”

5. $\check{a} + \check{i}, \check{u}, \check{r} \rightarrow e, o, ar$ (e.g. *indra + iha* $\rightarrow$ *indreha* ‘O Indra, here’)

5a. $\check{a} + e/ai, o/au \rightarrow ai, au$ (*atra eva* $\rightarrow$ *atraiva* ‘here indeed’)

6. $\check{i}, \check{u}, \check{r} + V \rightarrow y, v, r + V$ (e.g. *devī atra* $\rightarrow$ *devyatra* ‘the goddess here’)

Note: V here is restricted to unlike vowel; with like vowels, rule 1 applies.

Put differently, rule 6 is in an elsewhere relation to rule 1

GENERAL NOTE: Rules 2, 3, and 6 do not apply in certain morphological categories (e.g. in NA dual forms of nouns in $-e$, $-\bar{i}$, or $-\bar{u}$; e.g. *yuge* NOM/ACC.DU.N + *atra* $\rightarrow$ *yuge atra* ‘the two yokes here’) – technical term “pragr̥hya”.

Consonant Sandhi

Recall the issue of permitted finals (k/g , t/d , p/b , $\dot{n}$, n , m)

1. Voicing assimilation

$[+ \text{stop}] > [\alpha \text{ voice}] / __ \# [\alpha \text{ voice}]$

E.g. *tad* + *atra* → *tad atra* ‘this here’; *tad* + *saḥ* → *tat sa(h)* ‘he this’

Different from internal sandhi, which only takes place before obstruents

2. $[+ \text{stop}, \alpha \text{ place}] + \# h \rightarrow [+ \text{stop}, \alpha \text{ place}, + \text{voice}] [+ \text{stop}, \alpha \text{ place}, + \text{voice}, + \text{asp}]$

E.g. *tad* + *ha* → *taddha* ‘that PTCL’

3. $[+ \text{stop}, \alpha \text{ place}] \rightarrow [+ \text{nasal}, \alpha \text{ place}] / \# __ N$

E.g. *tad na* → *tan na* ‘not that’, *dik-nāga-* → *diñnāga-* ‘elephant of the quarters; name of a famous Buddhist philosopher’

5. Special rules for dental stops

$t/d \rightarrow c(h)/j / __ \# [+ \text{stop}, + \text{pal}] \rightarrow cc(h), jj$ (e.g. *tad ca* $\rightarrow$ *tac ca* ‘and that’)

$t/d + \# \acute{s} \rightarrow cch$ (e.g. *tad śrutvā* $\rightarrow$ *tacchrutvā* ‘having heard that’)

$ch [c^h] \sim [c^{\acute{s}}]$; so a consequence of the preceding rule

$([+ \text{stop}, + \text{dental}] \rightarrow [+ \text{retr}] / \# __ [+ \text{stop}, + \text{retr}])$

$t/d \rightarrow l / \# __ l$ (e.g. *tad likhati* $\rightarrow$ *tallikhati* ‘(s)he writes that’)

5. Rules for final *-n*

$n \rightarrow \{\text{ṇ}, \tilde{n}\} / \# __ [+ \text{stop}, + \text{voice}, \{[+ \text{retr.}], [+ \text{pal}]\}]$

E.g. *aśvān jayati* $\rightarrow$ *aśvāṇ jayati* ‘(s)he wins horses’

$n \rightarrow \text{ṁl} \text{ or } \check{l} / \# __ l$

E.g. *lekhān likhati* $\rightarrow$ *lekhāṁl likhati* ‘(s)he writes letters’

$n \rightarrow \text{ṁ} + [+ \text{ sib}, \alpha \text{ place}] / __ \# [+ \text{stop}, - \text{voice}, - \text{grave}, \alpha \text{ place}]$

E.g. *aśvān tadā* $\rightarrow$ *aśvāṁstadā* ‘the horses then’

($\emptyset \rightarrow t / n __ \# [+ \text{sib}]$; e.g. *gacchan sa(h)* $\rightarrow$ *gacchan-**t**-sa(h)* ‘going he’ – only in early Vedic)

6. $\{n, \dot{n}\} \rightarrow \{nn, \dot{n}\dot{n}\} / \check{V} _ \# V$
 E.g. *gacchan eva* $\rightarrow$ *gacchanneva* ‘going EMPH’
7. $m \rightarrow \dot{m} / _ \# C$
 E.g. *aśvam tadā* $\rightarrow$ *aśvaṁ tadā*
 (Alternatively, before stop, *m* becomes the homorganic nasal)
8. $ch \rightarrow cch / \{\check{V}, \text{prefix } \bar{a}\} _ \# V$
 E.g. *tatra chāyāyām* $\rightarrow$ *tatra cchāyām* ‘there in the shade’

9. Final *s* and *r* (See also 2, 3, 4 above)

$s, r \rightarrow \text{ḥ} / __ \# \{[- \text{voice}], \#\}$

$\text{ḥ} \rightarrow [+ \text{sib}, \alpha \text{ place}] / __ \# [+ \text{obst}, -\text{voice}, - \text{grave}, \alpha \text{ place}]$ (optional before *s*, but *ḥ* is preferred)

devadattas pacati $\rightarrow$ *devadattaḥ pacati* ‘D. cooks’, *punar pacati* $\rightarrow$ *punaḥ pacati* ‘(s)he cooks again’

devadattas carati $\rightarrow$ *devadattaḥ carati* $\rightarrow$ *devadattaś carati* ‘D. moves’;
punar carati $\rightarrow$ $\rightarrow$ *punaś carati* ‘moves again’

devadattas sīdati $\rightarrow$ *devadattaḥ/s sīdati* ‘D sits’

9a. *r* remains before [+ voice], but *rr* → *r* with compensatory lengthening of preceding short vowel
punar āste → *punar āste* ‘(s)he sits again’; *punar ramate* → *punā ramate* ‘(s)he rests/enjoys again’

9b. *s* before [+ voice]

as → *o* (see Vowel Sandhi 2, 3 for further developments before vowel)

devadattas gacchati → *devadatto gacchati* ‘D goes’, *devadattas atra* → *devadatto ’tra* ‘D (is) here’; *devadattas āste* → *devadatta āste* ‘D sits/is sitting’

ās → *ā* (see also Vowel Sandhi 4)

manuṣyās gacchanti → *manuṣyā gacchanti* ‘people are going’; *manuṣyās āsate* → *manuṣyā āsate* ‘people are sitting’

s → *r* / {*ĩ, e, ai, ũ, o, au* } __ # [+ voice] (this *r* is subject to *rr* → *r*)

patis gacchati → *patir gacchati* ‘the husband/lord is going’; *patis ramate* → *patī ramate* ‘the husband/lord is resting/enjoying’

Some shallow-history notes on final-s sandhi

- a. Final *-as* probably changed to *-aḥ* and before [+ voice] this changed to **-au* > *-o* (this explains why *-as* has the same fate as *-o* < **au*)

In early Vedic, *-as#a-* normally comes out as what has been handed down as *-o a-*, and the *-o* commonly is metrically short (e.g. *mahó árṇaḥ* ‘great flood’)

The most likely interpretation is that this reflects an early stage at which *-as#a-* was realized as *-a^wa-*, and that later on, *-a^wa-* changed to a monophthong *-o-*, comparable to (or anticipating) MIAr. *-ava-* > *-o-* (as in Skt. *bhavati* : Pali *hoti*)

- b. There seems to have been a similar change in final *-ās*, but synchronically, *-ās* before V acts more like *-ai*
- c. In eastern Middle Indo-Aryan (and some other Prakrit varieties) we find *-e* instead of *-o* for final *-as* – apparently a parallel development, except that *ḥ* weakened to *i* (i.e. *y*), rather than *u* (i.e. *w*)

d. After RUKI, final *-s* must have changed to *ṣ*, but before voiceless obstruents *ṣ* merged with *s*

before voiced segments, *ṣ* seems to have changed to **ṣ̣*, and as part of a mini-conspiracy to eliminate voiced sibilants, **ṣ̣* changed to *r* (by a crosslinguistically common change) – *patis gacchati* → *patir gacchati*
‘The lord/husband goes’

Mini-conspiracy [+ sib, + voice]*

Different effects include **ṣ̣* > *r* / ____ # [+ voice]
 **ṣ̣* > Ø / ____ [+ voice] (with comp. length)
 **ṣh* > [- voice, -asp] / [+ obstr.]

Shallow-history notes on some other types of external sandhi

1. $n \rightarrow \dot{n} + [+ \text{sib}, \alpha \text{ place}] / __ \# [+ \text{stop}, - \text{voice}, - \text{grave}, \alpha \text{ place}]$
Relic of an earlier stage at which the accusative plural masculine vowel-stem ending was still $-\bar{V}ns$, plus extension to contexts that did not have original final $-ns$

Thus: $*aśvāns$ [aśvāṁs] + $tadā$ = $*aśvāṁs\ tadā$ ‘the horses then’, but $*aśvāns\ rohati > aśvān\ rohati$ ‘(s)he mount horses’

Then extension to other cases of final n , as in *brahman* (/brahman/ [LOC.SG.N]) $tadā \rightarrow brahmaṁs\ tadā$ ‘in the sacred formula then’

Vedic preserves some other, earlier features: The accusative plural masculine before vowel appears in certain contexts as $\bar{a}\dot{m}$ (presumably from $*-\bar{a}\dot{m}z$, with loss of $-z$ by “mini-conspiracy”) or $-\bar{i}\dot{m}r$, $\bar{u}mr$ (with $-z > -r$ by “mini-conspiracy”)

2. $n \rightarrow nn / \check{V} _ \# V$

Possibly indirect reflex of a stage at which final *-nt* had changed to *-nn* before being simplified to *-n*

The process evidently was extended to contexts that did not have a final *-nt*.
gacchants > *gacchant* > *gacchann* > *gacchan* ‘going NOM.SG.M
Hence also *rājan atra* → *rājann atra* ‘O king, here’

3. Vedic $\emptyset \rightarrow [+ \text{stop}, \alpha \text{ place}] / n _ \# [+ \text{sib}, \alpha \text{ place}]$

E.g. *gacchan sa* → *gacchan-t-sa* ‘going he’

This might reflect an earlier stage at which final *-nt* was still preserved, with *-t* reinterpreted as epenthesis. Again, the process was extended to all contexts with final *-n* in this context; but it was lost in Post-Vedic

4. $t/d + \# \acute{s} \rightarrow cch$

Aspirated $/(c)ch/$ probably is (or was at one stage) phonetically $[c\acute{s}]$

In this regard, note $ch \rightarrow cch / \{\check{V}, \text{prefix } \bar{a}\} _ \# V$, which probably shows that *ch* is at some level bisegmental

5. In Vedic, *h* is realized as upadhmānīya ([Φ]) before voiceless labial and as jihvāmūlīya ([x]) before voiceless velar. So at this stage *h* assimilated in its place features to all following voiceless stops, including [+ grave]
6. Vedic collocations such as *dyaúṣ pitṛ́* ‘father sky’ and *divás pári* ‘around/toward the sky’ suggest an earlier stage that retained final -s and -ṣ before stops (if in the same prosodic phrase) and had -*h* at prosodic-phrase boundary (including utterance-final position) – e.g. *agníḥ pū́rvebhir* ... ‘Agni by previous ...’

As in almost all the other external-sandhi developments, there may have been a great amount of analogical extensions (in this case from prepausal/pre-prosodic-boundary position to elsewhere)

7. In early Vedic, the internal sandhi processes of retroflex assimilation and *n*-retroflexion apply variably across word boundaries, especially affecting clitics, but occasionally even full words

The domain seems to be the prosodic phrase and most commonly the change affects clitics (such as the particle *smā*) and other “light” elements (The variability peters out over the course of Vedic history; the phenomenon is no longer found in Epic and Classical Sanskrit)

vāmsu śīdati /*vāmsu sīdati*/ ‘he sits in the wooden (vessels)’, said of Soma (RV 9.57.3c)

pāri hí smā /*pāri hí smā*/ ‘around because PCL’ = ‘for around’ (RV 9.87.6a)\\

pāri ṇo /*pāri naḥ*/ ‘around us’ (RV 9.54.4a)

Vedic accent

A low + high-falling melody (anudāttatara – udātta – svarita)

agnīm īle ... ‘I invoke Agni ...’ (RV 1.1.1)

agnīmīle (Taittirīya Saṁhitā)

agnimīle (Rig Veda, Vājasaneyi Saṁhitā)

Complication in RV tradition: $i, u > \emptyset / C_y, v$ (even when accented)

*vr ₁ kíyàs	rāyás
vr ₁ kyàs	----

Contrast: vr₁kyàs rāyás
 ‘wolf.NOM.PL.F’ ‘wealth.NOM.PL.M/(F)’

Result: “Independent svarita” – a third tonal accent (of sorts)

Special development in the Śatapatha Brāhmaṇa

- | | | | |
|----|-----------------------|--------|---|
| a. | Earliest pattern (TS) | agnīnā | [a g n̄ i n ā] |
| b. | General Vedic | agnínā | [a g n̄ i n̄ ā] (falling pitch, post-accent) |
| c. | RV, VS | agnínā | [a g n̄ i n̄ ā] (falling pitch starts higher) |
| d. | Accent reinterpr. | agninā | [a g n i n̄ ā] (higher-pitch = accent) |
| e. | Reassertion of LH | agnīnā | [a g n i n̄ ā] |

Ultimate outcome looks like a shift from H to L; but things are more complicated

Consider “independent svarita”: *vr̥kyàs*. This remains as such. So there is no direct change of H to L

(The only “mark” in the Śatapatha Brāhmaṇa is L; the next syllable is H, and H continues to the next L)

Even in some Vedic texts, there is no accentuation (e.g. Aitareya Brāhmaṇa)

Further, there is a mode of Vedic recitation, at certain points of the ritual, which is characterized as “ekaśruti” (‘having one pitch, monotone’)

It appears that, in effect, ekaśruti becomes the norm in Post-Vedic (Classical, Epic Sanskrit)

Modern pronunciation varies

- In the Hindi-speaking area there is a tendency to have an accent on the penult if it is heavy, otherwise on the antepenult
- In other areas, with pervasive initial accent, there may be some prominence on the initial syllable, but the prominence is not as noticeable as in the Hindi area
- In both varieties, heavy syllables tend to sound more prominent to western ears than light syllables

OCP in the domain of preverbs (with variation at all stages of early Vedic)

Stage I	(<i>Ṕ</i>)	<i>Ṕ</i>	<i>Ṕ</i>	V
Stage II	(<i>Ṕ</i>)	<i>!Ṕ</i>	<i>Ṕ</i>	V
Stage III	(<i>Ṕ</i>)	<i>P</i>	<i>Ṕ</i>	V
(Stage IV	(P)	P	<i>Ṕ</i>	V)

ánu *sám* *prá* *yāt(a)* (TS 4.7.13.4, 5.7.7.2)
 after together forth go.IMV.2PL.ACT

‘go together forward after’

[Padapāṭha: *ánv* *íti* | *sám* *Ø* | *préti* [= *prá* + *íti*] | *yāta*] (OCP-downstep)

Later –

abhí *sam* *ā* *(a)vartanta* (TB 1.1.5.4)
 toward together forth turn.IPF.3PL.MID

‘they turned forth together toward’ (OCP-accent loss)

Vedic verb accent

[<i>tásmai</i>	<i>vísah</i>	<i>svayám</i>	<i>evā</i>	<i>namante</i>] _{MC}
CP.DAT.SG.M	people.NOM.PL.F	self	EMPH	bow.PRS.3PL
[<i>yásmin</i>	<i>brahmā</i>	<i>pūrva</i>	<i>éti</i>] _{DC}	
RP.LOC.SG.M	brahmin.NOM.SG.M	first.NOM.SG.M	go.PRS.3SG	

‘Even the common people bow to him for whom the brahmin goes first.’
(RV 4.50.8)

<i>áhann</i>	<i>áhim</i>	...
slay.IMPF.1SG	dragon.ACC.SG.M	

‘he slew the dragon’ (RV 1.32.1c)

Diachronic phonology

(derivation from PIE)

PIE background

Vowels

i (ī)	u (ū)
e ē	o ō
a (ā)	

Syllabic sonorants

m n r l

Consonants

	“T e c t a l s”				
	Labial	Dental	“Palatal” (prevelar)	Velar	Labiovelar
vl. stop	p	t	ḳ	k	k ^w
vd. sxtop	(b)	d	ɡ̣	ɡ	ɡ ^w
vd.asp.stop	bh	dh	ɡ̣h	gh	ɡ ^w h
vl. fric.		s	(h _i	h ₂	h ₃)
nasals	m	n			
liquids		r, l			

Plus “laryngeals”: h₁, h₂, h₃ (cover symbol: H)

Historical developments

Major vowel change

{*ē ā ō*} > *ā* (*esti* > *asti* ‘is’, *aḡeti* > *ajati* ‘drives’, *oktō* > *aṣṭā/au* ‘8’)

Hence also **ei*, *oi*, *ai* > **ai* > *e*; **eu*, *ou*, *au* > **au* > *o*

**ēi*, *ōi*, *āi* > **āi* > *ai*; **ēu*, *ōu*, *āu* > **āu* > *au*

(e.g. **woid-e* > *ved-a* ‘knows’, **leuk-* > *roc-a-te* ‘shines; is pleasing’)

- Complication: Brugmann’s Law –

**o* > *ā* / V __ CV (open syllable) as in **bhor-eye-ti* [bho.re.ye.ti] > *bhār-ay-a-ti* ‘causes to carry’

- Further complications: i. laryngeal effects, ii. analogy
 - i. k^we-k^wor-e [k^we.k^wo.re] > $ca-kār-a$ ‘made PRF.3SG’ [Brugmann]
 vs. $k^we-k^wor-h_2e$ [k^we.k^wor.h₂e] > $ca-kār-a \rightarrow ca-kār-a$ PRF.1SG
 (For identity of 1 and 3 SG PRF where Brugmann can’t apply, see e.g.
 $*woid-e$ [woy.de] > $*vaid-a$ > $veda$ PRF.3SG; $*woid-h_2e$ [woid.h₂e] >
 $*vaid-Øa$ > $veda$ PRF.1SG)
 - ii. Note also $gonh_1-eye-ti$ [gon.h₁e.ye.ti] > $jān-aya-ti$ ‘begets’ (No Brugmann)
 vs. $g^wom-eye-ti$ [g^wo.me.ye.ti] > $*gām-aya-ti \rightarrow gām-ayati$ ‘causes to go’
 (Cross-influence of *seṭ* and *aniṭ* roots)
- Plus some unexplained residue; esp. $*po.ti-s$ ‘powerful, able’ > $pātiḥ$ ‘lord; husband’

Major consonant changes

- Merger of velars and labiovelars into velars
- Palatalization of resulting velars before [+ vocalic, + front]
- Interaction with Major Vowel Change

PIE	*g ^w e-g ^w om-e ‘came PRF.3SG’
Velar merger	*ge-gom-e
Palatalization	*je-gom-e
Vowel merger	j a-gām-a (also Brugmann)

– Results

- contrast palatal : velar
- morphophonemic variation palatal ~ velar
- analogical developments (leveling)

*mu-n-k-e-ti	>	mu ñ cati ‘(s)he releases’
*mu-n-k-ō	>	*mu ñ kā(mi) → mu ñ cāmi ‘I release’

RUKI (Indo-Iranian development, some exceptions in Nuristani; but extending to some extent into Baltic and Slavic)

$$*s > *š / \begin{Bmatrix} i, u \\ r \\ k \end{Bmatrix} \text{ —}$$

where i, u = [+ vocalic, + hi], i.e. both ĭ, ŭ and Vi, Vu (in diphthongs)
 r = [± syll] (Indo-Iranian also r < *l)

e.g. **ni-sd-o-* ‘nest, abode’ > **nižda-*

Development of PIE “palatal” stops (Indo-Iranian)

[+ stop, + pal.] > š, ž / __ [+ obst]
> ć, j(h) elsewhere

e.g. **oktō* ‘8’ > **aštā* (> Skt. *aṣṭā(u)*)
 **k̑mtom* ‘100’ > **ćatam* (> Skt. *śatam*)

Changes into Sanskrit

ć > ś (debuccalization)

j > j (merger with *j* < *g^(w)* by palatalization)

jh > jh (merger with *jh* < *g^(w)h* by palatalization)
> h (hence no *jh*, exc. in onomatopoeia)

š/ž > ṣ/ṛ (differentiation from ś, contrast maintenance)

e.g. **k̑mtom* ‘100’ > **ćatam* > Skt. śatam
 **ni-sd-o* ‘nest, abode’ > **nižda* > **niṛda* (> Skt. *niṛḍa* > *nīḍa*)

Further changes into Sanskrit

[+ stop, + dent] > [+ retroflex] / [+ sib., + retroflex] ____

ṛ > Ø / ____ ḍ(h) (with compensatory length)
(part of “mini conspiracy” [+ sib, + voice])

**oktō* ‘8’ > **aštā* > **aṣtā* > Skt. *aṣṭā*(u)

**ni-sd-o* ‘nest, abode’ > **nižda* > **niṛda* > **niṛḍa* > Skt. *nīḍa*

Summary of tectal and sibilant changes

PIE	PIIr.	Skt.
k̑, g̑, gh̑ / ___ [+ obst]	š, ž, žh	ṣ, Ø
k̑, g̑, gh̑ elsewhere	ć, ј, јh	ś, j, (jh >) h
k, g, gh / ___ [+ front]	č, ј, јh	c, j, (jh >) h
k, g, gh elsewhere	k, g, gh	k, g, gh
s / RUKI ___	š, ž, žh	ṣ, Ø
s elsewhere	s, z	s, Ø

Some more examples (red indicates retroflex changes)

ok̑tō	aštā	aṣṭā	aṣṭā(u)	‘8’
k̑mtom	ćatam	śatam	śatam	‘100’
liġh-to	ližh-ta	liṛdha	liṛdha > līdha	‘licked’
k ^w e-k ^w or-e	ča-kār-a		ca-kār-a	‘made PRF.ACT.3SG’
ni-sd-o	nižda	nīṛda	nīṛda > nīda	‘nest, abode’
sed-			sad-	‘sit’

(Other, more complex developments also give rise to retroflexion.)

Possible problem: “Spontaneous retroflexion”

- *at-a-ti* ‘wanders’ > *aṭ-a-ti* (perhaps dissimilation; at any rate, rare)
- *mani* > *maṇi* ‘jewel’ (intervocalic; quite common; anticipation of MIAr)
(Other anticipations of MIAr.: *dhā-* ‘put, place; make’ : PPL *hi-ta* (rarely *dhi-ta*) – common with *dh*; also *grabh-* ‘seize, grab’ > *grah-*
Compare Skt. *bhavati* > MIAr. *hoti*
- Note also RV and elsewhere in Vedic: *ḍ(h)* > *ḷ(h)* / V __ V, as in *nīḍa* ‘nest, abode’ > *nīḷa*) – traces in MIAr. dialects

Another source for retroflexion – “ṇatva”

$n > ṇ / \{r, ṛ, ṣ\} (V) (\{[C, + \text{grave}], y\}) V __ V$ (still a bit variable in RV)

māṛg-ānām > *mārgāṇām* ‘of roads’

dviṣ-ya-māna > *dviṣyamāṇa* ‘being hated’

but *srj-ya-māna-* = *srjyamāna*, etc.

also *kṛ-na-t-ti* ‘cuts’ > *kṛṇatti* but *kṛ-n-t-anti* > *kṛntanti* ‘they cut’

Grassmann's Law and Bartholomae's Law – the real (hi)story

Traditional view

Bartholomae's Law (BL)

[+ stop + voice + asp] [+ stop, -voice] > [+ stop – asp] [+ stop + voice + asp]

Deaspiration/devoicing (Deasp)

[+ stop] > [- voice, - asp.] / ___ { s, # }

Grassmann's Law (GL)

[+ stop, + voice, + asp] > [- asp] / ___ (X) [+ asp]

	*bhudh-to	*bhudh-se-ti	*bhudh-s	*bhu-bhoudh-e
BL	bhuddha			
Deasp		bhutsati	bhut	
GL	buddha	---	---	bubodha
	<i>buddha</i>	<i>bhutsati</i>	<i>bhut</i>	<i>bubodha</i>

Up-to-date account (RV *butsati* vs. later *bhutsati* ‘desires to be aware’)

Bartholomae’s Law (BL)

[+ stop + voice + asp] [+ **obst**, -voice] > [+ stop – asp] [+ **obst** + voice + asp]

Final deaspiration/devoicing (FD)

[+ stop] > [- voice, - asp.] / __ #

Grassmann’s Law (GL)

[+ stop, + voice, + asp] > [- asp] / __ (X) [+ asp]

Mini conspiracy (MC)

*z(h), *zh – in this context, zh > s (another context: loss – *lizḍha* > *līḍha* ‘licked’)

	*bhudh-to	*bhudh-se-ti	*bhudh-s	*bhu-bhoudh-h _i e
BL	bhuddha	*bhudzhati		
FD			bhut	
GL	buddha	*budzhati	---	bu-bodh-a
MC		butsati		
	<i>buddha</i>	<i>butsati</i>	<i>bhut</i>	<i>bubodha</i>

For BL with [+ obst], including *s*, see Avestan **augh-sa* ‘you said’ > *aoyža* with Iranian deaspiration, just like **augh-ta* > *aogda* ‘he said’

Sanskrit-internal evidence that *s* did not block BL – *gdha*, TPPL of *ghas* < **ghs-ta-*

Note: RV *butsati* vs. later *bhutsati*

Motivation: Mini Conspiracy makes the synchronic operation of GL opaque

Resolution: replace *butsati* with *bhutsati* on model of *bhut*, where lack of GL is transparent

Further – Because of *buddha*, *bu-bodh-a*, the root is restructured as /**budh**/, not /bhudh/

Consequence: *bhutsati*, *bhut* are reanalyzed as having “aspirate throwback”

Some other changes

- *r* and *l* merge in Indo-Iranian
 - Iranian outcome: *r*
 - Skt. both *r* and *l*, and both can reflect either *r* or *l*.
 - **reudh*/*rudh*- ‘red, bloody’ : Skt. *rudhira*, *rohita*/*lohita*
 - **h₂leks*- : *rakṣ-a-ti* ‘protects’
 - **h₁l̥ng^whu* : *raghu* / *laghu* ‘light’
 - Conditions:
 - Partly dialectal (E MIAr *l* for Skt. *r*, as in *lājā* : *rājā* ‘king’)
 - Partly perhaps phonological: *l* is especially common in “labial” environments, as in *lohita*; note also the only root with *ḷ*: *kḷp*- ‘be successful’
 - In early Skt. *l* sometimes has negative connotations, as in *kalman* ‘ill-begotten deed’ vs. *karman* ‘deed’, perhaps because of prejudice against easterners

- Sibilant assimilation

- **keso-* ‘hare’ > **śasa-* > *śaśa*
- **s(w)eks* ‘6’ > **saṣṣ* > **ṣaṣṣ* > *ṣaṭ(ṣ)*

- New long syllabic *ṛ* ($\neq$ **ṛ* < *rH* / C, which has changed to *īr/ūr*)

- Vedic *ṛ* by compensatory length
 - PIIr. **dr̥jh-ta* > **dr̥zdha* > expect *dṛḍha*. Transmitted as *dṛdha*, but in Vedic, *dṛdha* has a prosodically heavy syllable; Classical Sanskrit has *dṛḍha*
- Analogical *ṛ* : *pitṛn* ‘fathers ACC.PL’, *pitṛṇām* GEN.PL (RV sometimes *ṛ*)
 - Other “vowel stems” have long vowels in ACC.PL and GEN.PL (e.g. *devān*, *devānām* ‘gods’, *agnīn*, *agnīnām* ‘fires’, *paśūn*, *paśūnām* ‘cattle’)
 - Hence e.g. **pitras* → *pitṛn*, **pitṛ-ām* → **pitṛṇām*

- (Short) syllabic sonorants

- $\underline{n}, \underline{m} > a$

-

- $\underline{r}, \underline{l} > \text{r}$ (rarely !)

E.g. $*m\underline{n}\text{-to-} > ma\text{-}ta\text{-}$ ‘thought (PPL)’; $*k^w\underline{r}\text{-to-} > k\underline{r}\text{-}ta\text{-}$ ‘done’

- Vowels and syllabic sonorants followed by laryngeals (SET roots vs. ANIT roots)
 - Major laryngeal changes

H > i / C __ C

H > Ø / [+syll] __ C with compensatory length

H > Ø / C __ [+syll] (but see also below)

H > Ø / [+syll] __ [+syll]

Ø > [+son] / [+son, +syll] ____ V

*H / C __ C > i

**stH-to-* ‘stood’ > *sthī-ta-*

**ḡenH-tu-* ‘born’ > *jani-tum*

*H / C __ [+syll] > Ø

**ḡonH-eye-ti* ‘case to be born’ > *jan-ay-a-ti*

*r, l + H / __ C > *r̄, l̄ > *ir*, *ūr*

**g^wrH-to-* ‘praised’ > *gūr-ta-*

/ __ V > *rr, ll > *ir*, *ur*

**g^wrH-e-ti* ‘praises’ > *gir-a-ti*

*n + H / __ C > *n̄ > *ā*

**ḡnH-to-* ‘born’ > *jā-ta-*

/ __ V > *nn > *an*

**ḡe-ḡnH-r(s)* ‘engender PRF.3PL’ >

RV *ja-jan-uḥ* (→ *jajñuḥ*)

*m + H / __ C > *m̄ > / → *ām* (!)

**krṃH-to-* ‘stride’ > *krān-ta-*

/ __ V > *mm

**ke-krṃ-r(s)* ‘stride PRF.3PL’ > *ca-kram-uḥ*

*V + H / __ C > *Ṽ*

**steh₂-tu-* > *sthā-tum* ‘to stand’

/ __ V > V Ø

*-*eh₂-es* > *-*aas* > -*ās* NOM.PL.F *ā*-stems

Note: *jan-* before V ~ *jani-* before C

vs. **gonH-eye-ti* ‘cause to be born’ > *jan-ay-a-ti*
 **genH-tu-* ‘born’ > *jani-tum*

Abduction that *i* is inserted before C (→ “union vowel”)

Stop + laryngeal > aspirate

*ponteH-s NOM.SG.M > *pantā-s (Avest. pantā)

*p_ntH-es GEN.SG.M > path-aḥ (Avest. paθō)

Stop + laryngeal > aspirate

*ponteH-s NOM.SG.M > *pantā-s → pan**th**ās (analogy)

*p**nt**H-es GEN.SG.M > pa**th**-aḥ

Ablaut

Full grade

g^wem/g^wom

wert/wort

g^werH/g^worH

$(g^wer\theta/g^wor\theta)$

Ø-grade

$g^w\bar{m}/g^wm$

wrt

$g^w\bar{r}H$

$g^w\bar{r}$

Extended grade

$g^w\bar{e}m/g^w\bar{o}m$

wert/wort

$g^w\bar{e}rH/g^w\bar{o}rH$

$g^w\bar{e}r\theta/g^w\bar{o}r\theta)$

‘go’

‘turn’

‘praise, sing’

Full grade

jam/gam/gā[†]m

vart/vart

jar(i)/gar(i)

Ø-grade

ga/gm

vrt

gür (gïr)

Extended grade

jām/gām

vart/vart

jār(i)/gār(i)

[†] *gām* by Brugmann’s Law in open syllable

Full grade	Ø-grade	Extended grade
jam/gam/ gām	ga/gm	jām/gām
vart/vart	vṛt	vārt/vārt
jar(i)/gar(i)	gūr (gīr)	jār(i)/gār(i)

Brugmann

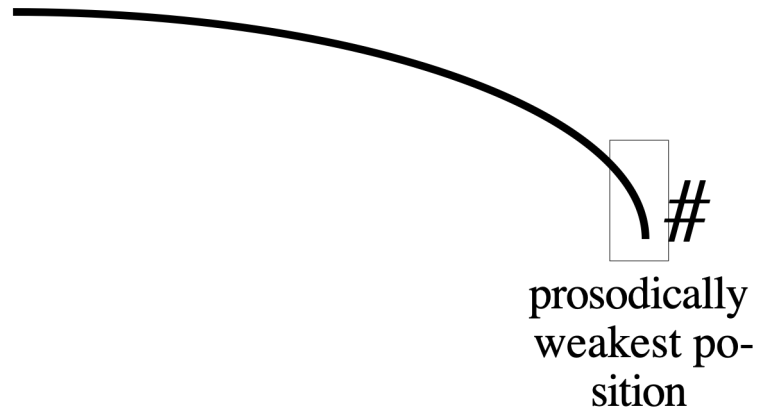
Base	Guṇa	Vṛddhi	
gam [†]	jam/gam	jām/gām	ANIT
vṛt	vart	vārt	ANIT
gr ⁱ (gṛ [†])	gar ⁱ /jar ⁱ	gār ⁱ /jār ⁱ	SET

[†] This is the root set up in Pāṇini's grammar

[‡] *gam* because *gm* by itself would be unpronounceable, and *ga* would not predict root-final *-m* vs. *-n*. (*gm* is impossible, since Sanskrit has no syllabic nasals)

Origin of Vedic verb accent distinction

a. Original canonical word order	S	O	V#			
b. Original canonical clause order	DC			MC		
c. Hence	[S	O	V] _{DC}	[S	O	V] _{MC} ##
d. Finality-conditioned accent loss	[S	O	V] _{DC}	[S	O	V] _{MC} ##
			[+ accent]			[- accent]
→e. Extension/Polarization:	DC			vs.	MC	
	[+ verb accent]				[- verb accent]	



Falling intonation and utterance-final prosodic weakness