SOME PROBLEMS WITH i̱-INSERTION IN PĀLI

by

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0.1 In Pāli there are several rules of i̱-insertion.
The most general and regular of these is the following:

$$(1) \quad \emptyset \rightarrow [i] \ / \left\{ \begin{array}{l} [\bar{V}C] \\ [VCC] \end{array} \right\} \text{------} + \text{C}$$

This rule accounts for forms such as:

tappita   / tapp + ta/ past passive participle of
tapp- 'satiate'

sāsita / sās + ta/   past passive participle of
sās- 'advise'

rūhita /rūh + ta/   past passive participle of
rūh- 'ascend'

tappiya /tapp + ya/ gerund of tapp-

0.2 Pāli represents an early stage of middle Indic.
At this stage of the language, i̱-insertion is in the process
of spreading. In some contexts where it exists to a
limited extent in Sanskrit, it is found quite regularly
in Pāli, and in other contexts where it doesn't exist
at all in Sanskrit, Pāli has innovated and the rule is
in the process of spreading.

The above rule is the most regular rule of i-insertion
in Sanskrit. However, in Pāli i-insertion has become
even more regular and more generalized. As a consequence,
this rule overlaps with certain other rules of i-insertion, e.g.

$$\emptyset \rightarrow \text{[i]} \quad / \quad C \text{-----} + \begin{bmatrix} C \\ + \text{ant.} \\ + \text{cor.} \end{bmatrix}$$

This rule accounts for forms such as:

   patita /pat + ta/ past passive participle of

      pat- 'fly, fall'

   japita /jap + ta/ past passive participle of

      jap- ' whisper'

0.3 However, because of the stage of development of
i-insertion which Pāli represents, it is inevitable that
this rule is in conflict with other rules involving
consonant clusters. Thus, in addition to i-insertion
there are rules assimilating consonants, producing
geminates. The process is straightforward and easy to
state, and the consonants can be grouped in terms of
resistence to assimilation: obstruents, nasals, l,v,y,r.
That is, a v assimilates to an l, to a nasal, to a sibilant,
and to an obstruent; nasals assimilate to sibilants
and obstruents; a sibilant assimilates only to an
obstruent, etc. When two consonants of the same class meet,
the first assimilates to the second, e.g. nm → mm; bd → dd.

This works only for stops, however; liquids and semi-vowels assimilate in the order given above, e.g. vy → vv. When a dental obstruent and a y come together, geminate palatals are produced: dy → jj; dhy → jjh; ty → cc; thy → cch. (The aspirates first become geminate aspirates (e.g. jhjh), which are then simplified).

Because of these various consonant assimilations basic root structure is often destroyed when a suffix or an ending is added to a root. For example, if the past participle suffix -ta is added to a root such as pad, the result is patta: d and t both being obstruents, the first (d) assimilates to the second (t), yielding tt. The assimilation has destroyed root structure and made the participle patta identical to any other participle which would be formed from a root whose first two segments are pa and whose third segment is an obstruent (e.g. patta < pat; patta < pac, etc.). i-insertion eliminates these problems; the participle of pad is padita, etc.

0.4 One of the most interesting and problematic areas in the development of i-insertion involves its behavior before y (providing a morpheme boundary intervenes). Since there is a gerund suffix -ya, this category will be used to illustrate most of the problems involved. Concerning i-insertion before y, the following points are relevant:

(1)   Before y, i-insertion takes place in general only
if a heavy syllable (V̄C, VCC) precedes the y:

tappiya, but gamma < /gam + ya/

(2)   i-insertion does not take place between geminate
palatals and y:

pajja /pajj + ya/ gerund of pajj- 'get into'

vijjha /vijjh + ya/ gerund of vijjh- 'pierce'

(3)   i-insertion does, however, take place between r
and y:

(2)   Ø   →   [i] /   [r] ------ +   [y]

ariya /ar + ya/ 'Aryan'

(4)   One of the main functions of i-insertion is to
preserve root structure.

0.5   Classical Sanskrit has no rule of i-insertion
before y, even if a heavy syllable precedes:

tarjya gerund of tarj- 'threaten'

āpya gerund of āp 'obtain'

cakṣya gerund of cākṣ 'see'

carya gerund of car 'move'

It is clear, then, that i-insertion following a heavy
syllable (rule (1)) and between r and y (rule (2)) are both
rules which have been added to the grammar of Pāli.

1.1 The first question worthy of consideration is why
i-insertion came to apply between r and y when it does not
apply between any other single consonant and y.[1] That the

sequence ry originally underwent assimilation in Pāli rather
than i-insertion can be seen from forms such as ayya, ariya
(Skt. arya); niyyāma (Skt. niryāma); udīyati (Skt. udīryate).[2]
However, there are only a few such forms, and they usually
alternate with forms with an i inserted. The later and usual
forms are those with i.

1.2 A look at the way in which the assimilation rules
work may give us a possible answer to the question of why
i-insertion takes place between r and y. Remember that the
order of assimilation is obstruents, sibilants, nasals, l,
v, y, r. Thus, y assimilates to every other consonant in the
language except r. This means that in a root which ends in
any consonant except r, the final consonant and the y can
assimilate without disturbing the root structure at all:
/gam + ya/ → gamma, gerund of gam 'go'; /mas + ya/→ massa,
gerund of mas 'touch'; /pac + ya/ → pacca gerund of pac 'cook',
etc. The only place where the root structure would be
obscured is where an r precedes the y, because r assimilates
to every other consonant in the language, including y
(e.g. ayya < arya). The motivation for the loss of the rule
of assimilation or r and y must then have been the attempt
to preserve root structure. This is logical because the
function of i-insertion generally seems to be to preserve
root structure. When the assimilation rule was lost, it
was replaced by i-insertion, as the cluster ry is not permitted.[3]

The synchronic repercussions of the addition of i-insertion will be discussed below.

2.1 The next problem concerns points (1) and (2) in section 0.4. As stated above, Sanskrit had a rule of i-insertion following a heavy syllable in some contexts (in particular before a suffix or an ending with an initial dental), but there is no such rule in Sanskrit when y follows a heavy syllable. However, by generalizing the rule to include y, Pāli made it unnecessary to specify any particular consonants in the environment of the rule (e.g. tappiya). Recall that the environment is stated simply as $\begin{bmatrix} \bar{V}C \\ VCC \end{bmatrix}$ ------ + C . This is a very natural type of extension and represents a definite rule simplification.

2.2 Even though the rule of i-insertion following a heavy syllable was generalized to apply before y, we find that there are still some cases where consonant assimilation rather then i-insertion takes place in this environment. The following forms illustrate this:[4]

gerund (Pāli)	3 Sg. present (Pāli)	root(Skt.)
āpajja	āpajjati	pad 'get into'
khajja	khajjati	khād 'chew'
anuvijja	anuvijjati	vid 'know'
nibbijjha	nibbijjhati	vidh 'pierce'

vivicca	viviccati	vit 'separate'

but:

visajjiya	vissajjati	sarj 'set free'
gajjiya	gajjati	garj 'roar'
rundhiya	rundhati	rundh 'break'
vattiya	vattati	vart 'turn'
sāsiya	sāsati	sās 'advise'
tappiya	tappati	tarp 'satiate'
upāsiya	upāsati	ās 'sit'

Such forms reveal that the only context in which a cluster CCy undergoes assimilation instead of i-insertion is when the consonants are palatals (aspirated or unaspirated). The reasons behind this irregular assimilation of three consonants will become clearer if we investigate several other developments within the verbal system.

2.3 Besides the gerund suffix -ya which we have been discussing, there is in Sanskrit a present tense suffix -ya-. There are a couple of other present tense suffixes (-na-; -cch-), but -ya- is added to the largest number of verbs in the present tense. Many roots which have this present tense suffix -ya- end in dental obstruents. Because of consonant assimilation in Pāli, these types of presents came to have a new structure: The 3 Sg. present of the root pad in Sanskrit is padyate. This becomes Pāli pajjati (dy > jj). The present stem of vit is Sanskrit vityate, Pāli viccati (ty > cc). The present stem of Sanskrit vidh is vidhyate,

Pāli vijjhati (dhy > jjh). Through this assimilation, the original suffix -ya- is obscured and a new present stem is created. (Skt. present padya-, Pāli present stem pajja-). For various reasons which are of no concern to us here, the present stem began to be used in other verbal categories in addition to the tenses normally built on this stem. Originally the gerund, with the suffix -ya, was made from the bare root, not from the present stem. That is, if the present tense of a particular verb has a suffix in Sanskrit (e.g. pad + ya + te; śak + no + ti),[5] the gerund will be formed from the simple root, without this suffix: pad + ya; sak + ya, where pad and śak are the roots and -ya is, of course, the gerund suffix. Thus, in Sanskrit, the 3 Sg. present of a root such as pad is padyate /pad + ya + te/ and the gerund is padya /pad + ya/. In Pāli, however, the 3 Sg. present becomes pajjati (dy > jj). The gerund also becomes pajja.

At an early stage of the language, when the present stem was infiltrating into other verbal categories, but hadn't become completely generalized yet, a gerund such as pajja could be analyzed as being formed either from the new present stem pajj-, or from the original root pad. Since y assimilates to all other consonants (except r), the result will be the same in both cases. If the gerund suffix -ya is added to the present stem pajj-, assimilation and cluster simplification

will have to take place: /pajj + ya/ → /pajj + ya/ → pajja. If -ya is added to the root pad, assimilation will take place: /pad+ ya/ → pajja.

Thus, an ambiguity existed at one stage of the language as to whether the gerunds of some verbs were formed from the present stem or from the root. Notice however, that if the gerund is interpreted as being from the present stem (pajj-), this results in an assimilation of 3 consonants (jj + y). This is irregular, for, as we have seen, i-insertion is supposed to occur after a heavy syllable in Pāli. However, the fact that the gerund formation was ambiguous allowed the assimilation to remain, for there is no rule of i-insertion between a single consonant and y. The regular rule is assimilation (e.g. gamma, from /gam + ya/). Therefore, if the gerund pajja were interpreted as being from the original root pad, it would regularly be formed by the assimilation rule (/pad + ya/ → pajja). The possibility that the ambiguous gerunds were regular formations from the root (rather than the present stem) caused the language to tolerate the otherwise irregular assimilation.

2.4 That this is a plausible reason for the preservation of an irregular assimilation rule can be verified by examining other categories where inherited forms were ambiguous as to whether they were formed from the root or from the present stem. These forms were not allowed to be formed through

irregular assimilation, but, rather have i-insertion. An example of this is the Skt. infinitive pattum, from the original root pad (Pāli pajj-). This root has already been discussed. Recall that pajj- is formed from pad plus the present tense suffix -ya-. The formation of the inherited infinitive pattum is just as ambiguous as the formation of the inherited gerund pajja. pattum can be the result of /pad + tum/ → pattum or of /pajj + tum/ → /pajttum/ → /patttum/ → pattum. There is an important difference, however, between pattum and pajja. There is a regular rule of i-insertion in the environment / C ----- + $\begin{Bmatrix} C \\ +ant. \\ +cor. \end{Bmatrix}$ in Pāli. This means that even if the pre-Pāli infinitive pattum is interpreted as being formed from the original root pad rather than from the present stem pajj-, it is still irregularly formed, because i-insertion is the regular rule between a consonant and a morpheme boundary plus a dental. Thus, the attested infinitive in Pāli is pajjitum, not pattum*.

2.5 In later stages of Pāli, many verbs generalized the present stem completely. The resulting lack of alternation automatically made the present stem the new (underlying) root. That is, if the original root no longer remains anywhere, the present stem is interpreted as being the new root. For example, if pajj- were to be used as the stem from which all verbal forms are built, it would be felt to the root, since

now there would no longer be any alternations of the type pajj- ∿ pad.

Some verbs never generalized the present stem completely, so that the original root is still available. Other verbs, however did. Even though for these verbs no ambiguity exists any longer in the attested stages of Pāli because of complete generalization of the present stem, the gerund is still formed through assimilation of the geminate palatals and y, rather than through i-insertion. For example, the Pāli root vijjh- is original (Skt.) vidh. The present stem vijjh- (from Skt. vidh + ya) has been completely generalized in Pāli, but the gerund is still vijjha, not vijjhiya*. The fact that ambiguity once existed and still exists in some roots with this structure, apparently allowed assimilation to apply generally to the sequence CC+y, where the consonants are palatals. The result is a phonologically predictable exception to i-insertion rather than a few idiosyncratic exceptions.[6]

2.6 The question should now be raised as to why other roots which end in final geminates in Pāli have i-insertion before y rather than assimilation, as we find with final palatals. From the forms given in section 2.2, we can see that Pāli roots such as tapp- and vatt- end in geminates just as vijjh- and pajj-. There is one important difference, however: tapp- and vatt- are from the Sanskrit roots tarp and vart. Since

r̠ assimilates to all other consonants, this causes the <u>roots</u> in
Pāli to end in geminates. Notice that in roots such as this,
there could never have been an ambiguity as to whether the
gerund was formed from a root with a single final consonant
or from a present stem with final geminates, because the
root itself ends in geminates: <u>tapp-</u>, etc.due to assimilation
within the root: Skt. <u>tarp</u>, Pāli <u>tapp-</u>. Therefore, when
the rule of <u>i</u>-insertion between a heavy syllable and y̠ was
added to the grammar of Pāli, roots such as <u>tapp-</u>, which
unambiguously end in 2 consonants, automatically underwent
this added rule of <u>i</u>-insertion. This is apparently also the
explanation for the behavior of the forms <u>sajjiya</u> and <u>gajjiya</u>
(from the Skt. roots <u>sarj</u> and <u>garj</u>). For the <u>jj</u> of these forms
is historically derived from a cluster <u>rj</u> (by assimilation
within the root) and therefore does not alternate with a
single stop. That is, at the time that <u>i</u>-insertion in the
gerunds got fixed in the language, the <u>jj</u> of <u>sajj-</u> and <u>gajj-</u>
unambiguously formed part of the (underlying) root.

    2.7 There are a few roots which in Sanskrit end in
consonants other than dental obstruents and which have the
suffix -<u>ya</u>- in the present tense: Skt. <u>tāmyati</u>, Pāli <u>tammati</u>
'faint'; Skt. <u>dīpyati</u>, Pāli <u>dippati</u> 'shine'; Skt. <u>divyati</u>,
Pāli <u>dibbati</u> 'play'.[7] Even though the formation of the gerunds
from these roots is ambiguous, just as it is from roots in final

palatals, these roots in final non-palatal consonants form their gerunds with i-insertion. The reason for this is fairly clear. There are relatively few roots which both end in consonants other than dentals and had in Sanskrit the present tense suffix -ya-. This means that in Pāli there would be perhaps one isolated example of a root in final -pp, one in final mm, one in final vv, etc. which would have to be marked as exceptions to i-insertion before y as a result of having had ambiguous gerund formation, at some stage of the language at least. But except for the palatals, there is no genuine class of root-final geminate consonants which has been created as a result of assimilation.

2.8 As a result of the processes discussed above, gerunds ending in palatal plus a (-jja, -cca, -jjha , -ccha) can come from several sources: roots which unambiguously end in a dental, such as pat-: pacca; roots which end in a dental and have a present stem in a palatal geminate(which may be about to be reanalyzed as the root), such as pad- : present stem pajja- : gerund pajja; roots ending in velar or palatal, such as pac- : pacca. Thus, all roots in final palatals form their gerunds through assimilation, even when the root ends in geminate palatals, creating a heavy syllable, and, of course, the environment for i-insertion.

2.9 The expected development at a later stage of Indic would be for i-insertion(rather than assimilation) to begin

to apply in the gerunds of those roots which in Pāli now end
in geminate palatals and which are no longer ambiguous;
(that is, in those roots which were ambiguous at one time,
but which later have reanalyzed the present stem as the
(underlying) root. Eventually we would expect that the
present stem would be generalized into all categories in all
verbs. At that point, no such ambiguity would exist at all
any longer in the formation of gerunds. At such a stage,
i-insertion will probably oust completely the assimilation
of geminate palatals and y. Verification of this must
await further investigation.

3.1 The next part of this paper is devoted to a
discussion of some synchronic issues which historical dev-
elopments such as the ones just discussed bring to light.

3.2 The addition of the rule of i-insertion between
r and y is interesting historically because we can see
plausible motivation for its addition in this context but
in no other similar contexts (i.e. between any other single
consonant and y). Synchronically, its effects are relatively
harmless. It caused an extra rule of i-insertion to be in
the grammar, which could be viewed as a complication. However,
the clarity which it added in terms of preserving root structure
would seem to me to outweigh the fact that the grammar is
burdened with an extra rule of i-insertion.[8]

3.3 The effects of the assimilation of geminate palatals and y are much more complicated. It is with the manner of characterization of this irregular assimilation that the rest of this paper is concerned.

As we have seen, rule (1), i-insertion following a heavy syllable, does not apply if the environment consists of geminate palatals followed by y. Instead, assimilation of the palatals and y takes place, followed by simplification of the 3 consonants: jjy → jjj → jj.

3.4 We are now faced with the problem of how to characterize this exceptionality. Perhaps the most logical first consideration would be rule ordering. If the rule of assimilation of palatal consonants with y could be ordered to apply before i-insertion, this would eliminate a great deal of the difficulty. The few forms such as gajjiya would be exceptions to the assimilation rule, and because they are exceptions, they will then undergo the i-insertion rule.

3.5 Even though this solution is very simple and accounts for the facts, it has extremely serious shortcomings. First of all, the assimilation rule for palatal geminates plus y would have to be separate from the regular assimilation which applies to all other consonants(except r). This would be counterintuitive in so far as y does assimilate to single palatals, just as it assimilates to all other consonants (except r). If, on the other hand, i-insertion applies first,

the roots with geminate palatals will have to be marked as exceptions.[9] The roots with palatals could then be included in the rule of assimilation of other consonants with y:

$$
\begin{array}{cc}
C & y \\
1 & 2
\end{array}
\begin{array}{c}
\text{----} \searrow \\
\text{----} \nearrow
\end{array}
1\ 1
$$

3.6 It is possible that we could justify ordering the palatal plus y assimilation rule before the i-insertion rule by claiming that since it involves assimilation of 3 consonants, this part of the rule should be separated from the other assimilation rules, i.e., we could make the assimilation of geminate palatals with y a separate rule. Even if this is true, however, the rule ordering solution still presents serious difficulties. In fact, it makes several incorrect claims about i-insertion at this stage of the language.

Ordering the rule of assimilation of palatals with y before i-insertion makes the following claims:

(1) It claims that this assimilation rule is felt to be a regular rule of the language, in no way exceptional. Forms which undergo it have no further connection or relation to the rule of i-insertion which follows it.

(2) It claims that forms like gajjiya which undergo i-insertion rather than assimilation do so as a result of their being exceptions to the assimilation rule.

These claims seem to me to be false. i-insertion is in the process of pervading the entire language. It has become

so wide spread that even in contexts where assimilation is still the most regular rule (such as after a single consonant followed by a morpheme boundary plus y), i-insertion is found sporadically. Thus, even though a gerund such as labhiya has to be characterized formally at this stage as an exception to assimilation of a single consonant plus y, it seems unlikely that a speaker would have felt it to be a real exception. Rather, it has fallen under the generally most productive of the 2 rules (i-insertion, as opposed to assimilation). Thus, ordering of assimilation before i-insertion in effect claims that the former takes precedence over the latter, while the opposite is the actual tendency. If assimilation took precedence over i-insertion, sajjiya and gajjiya would probably have ceased being formed by i-insertion and we would at least find alternate forms with assimilation, for, as we have seen, assimilation is the regular rule for palatals plus y.

3.7 Taking these facts into consideration, it seems fairly clear that the assimilation of geminate palatals with y has to be considered an exception to i-insertion (rule (1)). This is especially true since this rule of i-insertion is the most regular of the various rules of i-insertion in the language.

If the rules of i-insertion apply before the assimilation rules, the latter can be considered to be "clean-up"rules.

That is, they take care of all of the forms which are either exceptions to one of the i-insertion rules, or are contexts in which i-insertion hasn't yet spread. This ordering allows us to make a definite connection between i-insertion and its failure to apply between geminate palatals and y. It also allows us to combine the assimilation of geminate palatals and y with the assimilation of a single palatal and y and with other consonants and y.

3.8 Gerunds such as gajjiya, which undergo i-insertion, do so historically because they were never ambiguous as to their formation (cf. above). However, since there are gerunds which were once ambiguous as to their formation, but which are no longer ambiguous because of complete generalization of the present stem, a root such as gajj- (with original double final consonants) is no different synchronically from a root such as pajj- (which was originally pad). At this stage, then, there is no way of telling that the root gajj- has the gerund gajjiya because it was originally unambiguous, whereas the root pajj- has the gerund pajja because it was originally ambiguous. Hence, synchronically, sajjiya and gajjiya must be interpreted as having i-insertion for the same reason as labhiya has i-insertion. In other words, they are simply forms which are undergoing the most current and productive rule, even though they have environments where i-insertion hasn't really made its way yet.[10]

Thus, it is very doubtful that forms like gajjiya are felt to undergo i-insertion as a result of being exceptions to an assimilation rule. The latter would claim further that i-insertion is acting as a "clean-up"rule for the assimilation rule. It should be obvious by now that this is not the case. Synchronically, gajjiya and sajjiya seem to indicate that i-insertion has begun to penetrate into yet another environment.

   3.9 If i-insertion cannot plausibly be ordered after assimilation of palatals with y, then the forms which under- go this assimilation must be characterized as exceptions to i-insertion. This can be done by means of a readjustment rule. This manner of characterization is not without problems either, however. Exceptions to rules of epenthesis create problems because there is no segment actually present in the morpheme which can be marked as exceptional in failing to undergo the rule. In The Sound Pattern of English, Chomsky and Halle suggest that exceptions to epenthesis may be evidence for marking contexts as exceptions to rules. However, they have no compelling evidence and therefore discuss the problem very briefly. Coats (1970) has proposed that each lexical item be marked either + or - the environment of a rule. Thus, any segment which is marked as -environment of a rule may not function as part of the

environment of that rule. This seems to be a much more reasonable and plausible way to handle exceptions to epenthesis, because such morphemes do not have to be marked as exceptions to a rule when none of their segments fails to undergo that rule; Rather, the morphemes can be marked as exceptions to the environment of the rule, expressing the fact that they fail to condition the rule.

4.1 The exceptions to i-insertion in Pāli present one further problem. The root pajj-, for example, cannot simply be marked as -the environment for the i-insertion rule. The i-insertion rule specifies no specific consonants, so that if pajj- is marked as -the i-insertion rule, it will also fail to condition the rule when the consonant following the morpheme boundary is one other than y. This is, of course, incorrect. When a suffix beginning with a consonant other than y is added to a root like pajj-, i-insertion occurs: /pajj + ta/ → pajjita; /pajj + tvā/ → pajjitvā, etc. The readjustment rule will have to state an environment; it will have to state that roots in final geminate palatals will fail to condition i-insertion if they are followed by a morpheme boundary plus y. Notice that roots such as gajj-, whose gerunds do have i-insertion, will be exceptions to the readjustment rule. This makes a more correct claim about the nature of i-insertion in Pāli. The claim

is now that the gerunds in which geminate palatals assimilate

with y are exceptions to i-insertion, and that gerunds like

gajjiya are exceptions to the exception. By being exceptions

to the readjustment rule, they then undergo the more

productive and general rule of i-insertion.

FOOTNOTES

(1) Recall that before y, i-insertion takes place after a heavy syllable only.

(2) Pāli udīyati is from /udīyyati/ with the consonant cluster simplified because of the preceding long vowel.

(3) Unlike consonant clusters are in general not tolerated.

(4) I have not given any underlying forms here because as will become clear later, there is ambiguity of formation of the gerunds. To state this here would cause unnecessary confusion.

(5) 3 Sg. presents of pad and śak respectively, where -ya- and -no- are present tense suffixes.

(6) This problem will be further discussed below.

(7) vv → bb / V---- V

(8) Kenstowicz (1970) discussed a similar situation in Lithuanian where a rule changing accent seems to have no other motivation than to prevent another rule from applying. This prevention serves to preserve the underlying form of roots from being obscured.

(9) Problems in doing this will be discussed below.

(10) Between a single consonant and y and between geminate palatals and y.

REFERENCES

Chomsky, Noam and Morris Halle. 1968. The sound pattern of
    English. New York: Harper and Row

Coats, Herbert S. 1970. Rule environment features in
    phonology. Papers in linguistics 2.110-141

Davids, T. W. Rhys and William Stede. 1966. The Pāli
    text society's Pāli-English dictionary. London: Luzac
    and Company, LTD

Geiger, Wilhelm. 1956. Pāli literature and language.
    University of Calcutta

Kenstowicz, Michael J. 1970. Lithuanian third person
    future. Studies presented to Robert B. Lees by his
    students, ed. by Jerrold M. Sadock and Anthony L. Vanek
    95-109. Edmonton: Linguistic Research, Inc.

Whitney, William Dwight. 1885. The roots, verb-forms, and
    primary derivatives of the Sanskrit language. Leipzig:
    Breitkopf and Hártel