

# Appendices

## A - Table of paraphrase rules

अव्ययीभावः	
1	$\langle x-y \rangle A1 \Rightarrow y_6 f_x$ where $f$ maps $x$ to the noun with same semantic content. A function $f$ needs to be defined.
2	$\langle x-y \rangle A2 \Rightarrow x_3$ विपरीतं वृत्तम्
3	$\langle x-y \rangle A4 \Rightarrow x_6 y_6$ समाहारः
4	$\langle x-y \rangle A5 \Rightarrow x'_1 y_1$ यस्मिन् देशे $x' y'$ इत्यनयोः समानलिङ्गं स्यात् इति ।
5	$\langle x-y \rangle A6 \Rightarrow x_6 y_6$ समाहारः यदि $x =$ द्वि स्यात् तर्हि $x$ एवं $y$ इत्यनयोः प्रयोगः द्विवचने स्यात् ।
6	$\langle x-y \rangle A7 \Rightarrow x_6 y$
तत्पुरुषः	
7	$\langle x-y \rangle T_n \Rightarrow x_n y$ $2 \leq n \leq 7$
8	$\langle x-y \rangle T_n \Rightarrow x_n y$
9	$\langle x-y \rangle T_{ds} \Rightarrow x_6 ; y_6 ; y_6$ समाहारः
10	$\langle x-y-z \rangle T_b \Rightarrow x_1 y_1 z_1$
कर्मधारयः	

11	$\langle x-y \rangle K1 \Rightarrow x1$ तत् $y1$ च
12	$\langle x-y \rangle K2 \Rightarrow x1$ च $y1$ च
13	$\langle x-y \rangle K3 \Rightarrow x1$ च असौ $y1$ च
14	$\langle x-y \rangle K4 \Rightarrow x1$ इव $y1$
15	$\langle x-y \rangle K5 \Rightarrow x1$ $y1$ इव
16	$\langle x-y \rangle K6 \Rightarrow x1$ एव $y1$
17	$\langle x-y \rangle K7 \Rightarrow x1$ इति $y1$
बहुव्रीहिः	
18	$\langle x-y \rangle Bsd \Rightarrow x6$ च $y6$ च यदन्तरालम्
19	$\langle x-y \rangle Bsp \Rightarrow x3$ च $y3$ च प्रहृत्य इदं युद्धं प्रवृत्तम्
20	$\langle x-y \rangle Bsg \Rightarrow x7$ $y7$ गृहीत्वा इदं युद्धं प्रवृत्तम्
21	$\langle x-y \rangle Bsmn \Rightarrow x'$ $y1$ यस्य
22	$\langle x-y \rangle Bss \Rightarrow x1$ वा $y1$ यस्य
23	$\langle x-y \rangle Bsu \Rightarrow x1$ इव $y1$ यस्याः
24	$\langle x-y \rangle Bv \Rightarrow x$ $y1$ यस्य
25	$\langle x-y \rangle Bvs \Rightarrow y6$ $x'$ ये सन्ति ते
26	$\langle x-y \rangle BvS \Rightarrow y3$ सह
27	$\langle x-y \rangle BvU \Rightarrow x6$ इव $y$ यस्य
द्वन्द्वः	
28	$\langle x-y \rangle Di \Rightarrow x1$ च $y1$ च
29	$\langle x-y \rangle Ds \Rightarrow x1$ च $y1$ च
30	$\langle x-y \rangle S \Rightarrow y1$ $x1$
31	$\langle x-y \rangle d \Rightarrow x$ $y$

## B - Table of Semantic classifications

Semantic classifications of Sanskrit compounds					
अव्ययीभाव			तत्पुरुष		
1	अव्यय-पूर्वपद-अव्ययीभाव	A1	1	प्रथमातत्पुरुष	T1
2	अव्यय-उत्तरपद-अव्ययीभाव	A2	2	द्वितीयातत्पुरुष	T2
3	तिष्ठद्गुप्रभृति-अव्ययीभाव	A3	3	तृतीयातत्पुरुष	T3
4	संख्यापूर्वपद-नद्युत्तरपद-अव्ययीभाव	A4	4	चतुर्थीतत्पुरुष	T4
5	नद्युत्तरपद-अन्यपदार्थसंज्ञायाम्	A5	5	पञ्चमीतत्पुरुष	T5
6	संख्यापूर्वपद-वंशयोत्तरपद-अव्ययीभाव	A6	6	षष्ठीतत्पुरुष	T6
7	पारे-मध्ये-पूर्वपदषष्ठ्युत्तरपद-अव्ययीभाव	A7	7	सप्तमीतत्पुरुष	T7
बहुव्रीहि			8	नञ्-तत्पुरुष	Tn
1	द्वितीयार्थबहुव्रीहि	Bs2	9	प्रादि-तत्पुरुष	Tp
2	तृतीयार्थबहुव्रीहि	Bs3	10	कु-तत्पुरुष	Tk
3	चतुर्थ्यर्थबहुव्रीहि	Bs4	11	गति-तत्पुरुष	Tg
4	पञ्चम्यर्थबहुव्रीहि	Bs5	12	तद्धितार्थद्विगु	Tdt
5	षष्ठ्यर्थबहुव्रीहि	Bs6	13	उत्तरपदद्विगु	Tdu
6	सप्तम्यर्थबहुव्रीहि	Bs7	14	समाहारद्विगु	Tds
7	दिग्वाचक-बहुव्रीहि	Bsd	15	उपपद	U

8	संख्योभयपद-बहुव्रीहि	Bss	16	द्वितीयोपपद-तत्पुरुष	U2
9	उपमानपूर्वपद-बहुव्रीहि	Bsu	17	तृतीयोपपद-तत्पुरुष	U3
10	प्रहरणविषयक-बहुव्रीहि	Bsp	18	चतुर्थोपपद-तत्पुरुष	U4
11	ग्रहणविषयक-बहुव्रीहि	Bsg	19	पञ्चम्योपपद-तत्पुरुष	U5
12	सङ्ख्योत्तरपद-व्यधिकरण-बहुव्रीहि	Bvs	20	सप्तम्योपपद-तत्पुरुष	U7
13	सहपूर्वपद-व्यधिकरण-बहुव्रीहि	BvS	21	मयूरव्यंस्कादि	Tm
14	प्रादि-व्यधिकरण-बहुव्रीहि	Bvp	22	बहुपद-तत्पुरुष	Tb
15	उपमानपूर्वपद-व्यधिकरण-बहुव्रीहि	BvU	कर्मधारय		
16	नञ्-बहुव्रीहि	Bsmn	1	विशेषण-पूर्वपद-कर्मधारय	K1
17	बहुपद-बहुव्रीहि	Bb	2	विशेषण-उत्तरपद-कर्मधारय	K2
द्वन्द्व			3	विशेषण-उभयपद-कर्मधारय	K3
1	इतरेतर-द्वन्द्व	Di	4	उपमान-पूर्वपद-कर्मधारय	K4
2	समाहार-द्वन्द्व	Ds	5	उपमान-उत्तरपद-कर्मधारय	K5
3	एकशेष-द्वन्द्व	E	6	अवधारणापूर्वपद-कर्मधारय	K6
अन्य (others)			7	सम्भावनापूर्वपद-कर्मधारय	K7
1	द्विरुक्ति	d	8	मध्यमपदलोपिकर्मधारय	Km
2	केवल-समास	S	-		

# C - List of aphorisms

## List of implemented aphorisms

1. "अव्ययं विभक्ति-समीप-समृद्धि-व्युच्चार्थाभावात्पया-सम्प्रति-शब्दप्रादुर्भाव..." (2-1-6)
2. "यावदवधारणे" (2-1-8)
3. "सुप्रतिना मात्रार्थे" (2-1-9)
4. "अक्षशलाकासंख्याः परिणा" (2-1-10)
5. "अपपरिबहिरञ्चवः पञ्चम्या" (2-1-12)
6. "आङ् मर्यादाऽभिविध्योः" (2-1-13)
7. "लक्षणेनाऽभिप्रती आभिमुख्ये" (2-1-14)
8. "अनुर्यत्समया" (2-1-15)
9. "यस्य चायामः" (2-1-16)
10. "तिष्ठद्गुप्रभृतीनि च" (2-1-17)
11. "पारे मध्ये षष्ठ्या वा" (2-1-18)
12. "संख्या वंशयेन" (2-1-19)
13. "नदीभिश्च" (2-1-20)
14. "द्वितीया श्रितातीतपतितगतात्यस्तप्राप्तापन्नैः" (2-1-24)
15. "स्वयं क्तेन" (2-1-25)
16. "खद्वा क्षेपे" (2-1-26)

17. "सामि" (2-1-27)
18. "कालाः" (2-1-28)
19. "पूर्वसदृशसमोनार्थकलहनिपुणमिश्रक्षणैः" (2-1-31)
20. "चतुर्थी तदर्थार्थबलिहितसुखरक्षितैः" (2-1-36)
21. "पञ्चमी भयेन" (2-1-37)
22. "अपेतापोढमुक्तपतितापत्रस्तैरल्पशः" (2-1-38)
23. "स्तोकान्तिकदूरार्थकृच्छ्राणि केन" (2-1-39)
24. "सप्तमी शौण्डैः" (2-1-40)
25. "सिद्धशुष्कपक्वबन्धैश्च" (2-1-41)
26. "ध्वाङ्गेण क्षेपे" (2-1-42)
27. "क्तेनाहोरात्रावयवाः" (2-1-45)
28. "तत्र" (2-1-46)
29. "पात्रेसमितादयश्च" (2-1-48)
30. "पूर्वकालैकसर्वजरत्पुराणनवकेवलाः समानाधिकरणेन" (2-1-49)
31. "पापाणके कुत्सितैः" (2-1-54)
32. "उपमितं व्याघ्रादिभिः सामान्याप्रयोगे" (2-1-56)
33. "विशेषणं विशेष्येण बहुलम्" (2-1-57)
34. "पूर्वापरप्रथमचरमजघन्यसमानमध्यमध्यमवीराश्च" (2-1-58)
35. "श्रेण्यादयः कृतादिभिः" (2-1-59)
36. "क्तेन नञ्विशिष्टेनानञ्" (2-1-60)
37. "सन्महत्परमोत्तमोत्कृष्टाः पूज्यमानैः" (2-1-61)
38. "वृन्दारकनागकुञ्जरैः पूज्यमानम्" (2-1-62)
39. "कतरकतमौ जातिपरिप्रश्ने" (2-1-63)
40. "किं क्षेपे" (2-1-64)
41. "पोटायुवतिस्तोककतिपयगृष्टिधेनुवशावेहद्विष्कयणीप्रवक्तृश्रोत्रिय..." (2-1-65)

42. "प्रशंसावचनैश्च" (2-1-66)
43. "युवा खलतिपलितवलिनजरतीभिः" (2-1-67)
44. "वर्णो वर्णेन" (2-1-69)
45. "चतुष्पादो गर्भिण्या" (2-1-71)
46. "मयूरव्यंसकादयश्च" (2-1-72)
47. "अर्धं नपुंसकम्" (2-2-2)
48. "द्वितीयतृतीयचतुर्थतुर्याण्यन्यतरस्याम्" (2-2-3)
49. "नञ्" (2-2-6)
50. "ईषदकृता" (2-2-7)
51. "याजकादिभिश्च" (2-2-9)
52. "कुगतिप्रादयः" (2-2-18)
53. "संख्ययाव्ययासन्नदूराधिकसंख्याः संख्येये" (2-2-25)
54. "दिङ्गामान्यन्तराले" (2-2-26)
55. "तेन सहेति तुल्ययोगे" (2-2-28)

### List of non-implemented aphorisms

1. "यथाऽसादृश्ये" (2-1-7)
2. "अत्यन्तसंयोगे च" (2-1-29)
3. "तृतीया तत्कृतार्थेन गुणवचनेन" (2-1-30)
4. "कर्तृकरणे कृता बहुलम्" (2-1-32)
5. "कृत्यैरधिकार्थवचने" (2-1-33)
6. "अन्नेन व्यञ्जनम्" (2-1-34)
7. "भक्ष्येण मिश्रीकरणम्" (2-1-35)
8. "कृत्यैरुद्गणे" (2-1-43)
9. "संज्ञायाम्" (2-1-44)



10. "क्षेपे" (2-1-47)
11. "दिवसंख्ये संज्ञायाम्" (2-1-50)
12. "तद्धितार्थोत्तरपदसमाहारे च" (2-1-51)
13. "संख्यापूर्वो द्विगुः" (2-1-52)
14. "कुत्सितानि कुत्सनैः" (2-1-53)
15. "उपमानानि सामान्यवचनैः" (2-1-55)
16. "कृत्यतुल्याख्या अजात्या" (2-1-68)
17. "पूर्वापराधरोत्तरमेकदेशिनैकाधिकरणे" (2-2-1)
18. "नित्यं क्रीडाजीविकयोः" (2-2-17)
19. "उपपदमतिङ्" (2-2-19)
20. "अनेकमन्यपदार्थे" (2-2-24)
21. "चार्थे द्वन्द्वः" (2-2-29)

### List of Exception aphorisms

1. "अन्यपदार्थे च संज्ञायाम्" (2-1-21)
2. "कुमारः श्रमणादिभिः" (2-1-70)
3. "प्राप्तापन्ने च द्वितीयया" (2-2-4)
4. "कालाः परिमाणिना" (2-2-5)
5. "अमैवाव्ययेन" (2-2-20)
6. "तृतीयाप्रभृतीन्यन्यतरस्याम्" (2-2-21)
7. "तत्र तेनेदमिति सरूपे" (2-2-27)

# D - Screenshots

Department of Sanskrit Studies, University of Hyderabad, Hyderabad

## Sanskrit Compound Processor

### Introduction

In recent years Sanskrit Computational Linguistics has gained momentum. There have been several efforts towards developing computational tools for accessing Sanskrit texts. Most of these tools handle morphological analysis and sandhi splitting. Some of them also do the sentential parsing. However, there have been almost negligible efforts in handling Sanskrit compounds, beyond segmentation.

Sanskrit is very rich in compound formation. The compound formation being productive, forms an open-set and as such it is also not possible to list all the compounds in a dictionary. The compound formation involves a mandatory sandhi. But mere sandhi splitting does not help a reader in identifying the meaning of a compound. Typically a compound does not code the relation between its components explicitly. To understand the meaning of a compound, thus, it is necessary to identify its components, discover the relations between them, and finally produce a vighrahaakya of the compound.

### Features of Sanskrit Compounds

The Sanskrit word samasah for a compound means samasanam which means a "combination of more than one word into one word which conveys the same meaning as that of the collection of the component words together". While combining the components together, a compound undergoes certain operations such as loss of case suffixes, loss of accent, etc.. A Sanskrit compound thus has one or more of the following features:

1. It is a single word (ekapadam).
2. It has a single case suffix (ekavibhaktikam) with an exception of aluk compounds such as yudhis, irah, where there is no deletion of case suffix of the first component.
3. It has a single accent (ekasvarah).
4. The order of components in a compound is fixed.
5. No words can be inserted in between the compounds.
6. The compound formation is binary with an exception of dvandva and bahupada Bahuvrīhi).
7. Euphonic change (sandhi) is a must in a compound formation.
8. Constituents of a compound may require special gender or number different from their default gender and number. e.g. pācīkābhāryaḥ, pāṇipādam etc.

### Semantic classification of compounds

Semantically Panini classifies the Sanskrit compounds into four major types:-

- Tatpuruṣaḥ: (Endocentric with head typically to the right),
- Bahuvrīhi: (Exocentric),
- Dvandvaḥ: (Copulative)
- Avyayibhāvaḥ: (Endocentric with head typically to the left and behaves as an indeclinable).

### Sanskrit Compound Processor

There are four tasks involved in identifying the meaning of a compound:

- Segmentation
- Constituency Parsing
- Compound Type Identification
- Paraphrasing

<http://mansa>

Home page of Sanskrit Compound Processor

Department of Sanskrit Studies, University of Hyderabad, Hyderabad

**संस्कृत-समास-पदच्छेदकः**  
(Sanskrit Compound Segmenter)

**Introduction**

The Sanskrit compound segmenter is the first module of Sanskrit compound processor. It splits a compound into its constituents. For instance, the compound

*Sumitrānandavardhanaḥ*

is segmented as

*Sumitrā-ānanda-vardhanaḥ*

Each of the constituent component except the last one is typically a compounding form (a bound morpheme). [Read more...](#)

Encoding:  word:

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तपस्स्वाध्यायनिरतम् = तपस्-+स्वाध्याय-+निरतम्

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Screenshot of Segmenter

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संस्कृत-समास-सामर्थ्य-निर्धारकः  
(Sanskrit Compound Constituency Parser)

**Introduction**

The constituency parser is third step to paraphrase. This module parses the segmented compound syntactically by pairing up the constituents in a certain order two at a time.

*Sumitrā-ānanda-varhanaḥ*

is segmented as

*<<Sumitrā-ānanda>-varhanaḥ>*

[Read more...](#)

Encoding:  word:

For instance: सुमित्रा-आनन्द-वर्धनः

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<<तपस्-स्वाध्याय>-निरतम् >

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Screenshot of Constituency Parser

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**संस्कृत-समास-भेदनिर्धारकः**  
(Sanskrit Compound Type-identifier)

**Introduction**

This module determines the type on the basis of the components involved. For instance,

<<Sumitrā-ānanda>-vardhanaḥ>

is tagged as

<<Sumitrā-ānanda>T6-vardhanaḥ>T6

where T6 stands for compound of type Ṣaṣṭhītatpuruṣa. This module needs an access to the semantic content of its constituents, and possibly even to the wider context. [Read more...](#)

Encoding: Unicode Devanagari | Word: नील-मेघः | [Show parsing](#)

For instance: <<सुमित्रा-आनन्द>T6-वर्धनः>T6

**नील-मेघः**

Compound Type	कर्मधारयः
Compound Sub Type	विशेषण-पूर्वपद-कर्मधारयः
Compound Type	बहुव्रीहिः
Compound Sub Type	षष्ठ्यर्थ-बहुव्रीहिः

Screenshot of Type-Identifier

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**संस्कृत-समास-विग्रहवाक्योत्पादकः**  
(Sanskrit Compound Paraphrase Generator)

**Introduction**

The Paraphrase generator is final step of Sanskrit compound processor. This module generates the paraphrase automatically from a tagged compound word. For instance :-

<<Sumitrā-ānanda>T6-vardhanaḥ>T6

is paraphrased as

Sumitrāyāḥ ānandaḥ = Sumitrānandaḥ

Sumitrānandasya vardhanaḥ = Sumitrānanda-vardhanaḥ

[Read more...](#)

Encoding:  word: <<<ज्ञान-निष्ठा>T7-योग्यता>K1-प्राप्ति>T6-द्वारेण>T6

For instance: <<सुमित्रा-आनन्द>T6-वर्धन>T6

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ज्ञाने निष्ठा = ज्ञाननिष्ठा  
ज्ञाननिष्ठा सा योग्यता च = ज्ञाननिष्ठायोग्यता  
ज्ञाननिष्ठायोग्यतायाः प्राप्तिः = ज्ञाननिष्ठायोग्यताप्राप्तिः  
ज्ञाननिष्ठायोग्यताप्राप्तेः द्वारम् = ज्ञाननिष्ठायोग्यताप्राप्तिद्वारम्  
तेन ज्ञाननिष्ठायोग्यताप्राप्तिद्वारेण

Screenshot of Paraphrase Generator