

Aṣṭādhyāyī: An introduction

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The First Formal system of Grammar: Pāṇini's Aṣṭādhyāyī

Pāṇini's Aṣṭādhyāyī

- ▶ Circa 500 B.C.E.
- ▶ Extant Grammar of the then prevalent Sanskrit Language
- ▶ Around 4000 sutras¹(aphorism)
- ▶ 8 chapters 4 sections each

¹alpākṣaram (concise) asandigdham (unambiguous) sāravat (contains essence) viśvatomukham (general) |
astobham (continuous) anavadyam (without flaw) ca sūtraḥ sūtravido viduḥ || (vāyu purāṇa)

Aṣṭādhyāyī .. contd

It is admired for its

- ▶ simplicity
- ▶ completeness of the descriptive coverage
- ▶ rigorous consistency in the use of meta language
- ▶ intricate system of conventions governing rule application and rule interaction
- ▶ richness in various aspects of informatics

One of the greatest monuments of human intelligence (Bloomfield) is only beginning to claim its rightful position in linguistics. Many of the insights of Panini's grammar still remain to be recaptured, but those that are already understood constitute a major theoretical contribution.

Paul Kiparsky, Emeritus Prof. Stanford University

'The encyclopedia of Language and Linguistics', Asher, pp 2923.

Panini, then, was not an ancient and nebulous precursor of a science in which everything has since been done better, but a distant colleague of genius from whom linguists are still able to learn.

Prof. Fritz Staal

Pāṇini , 'Encyclopedia of Language and Linguistics', Vol-6, Page no: 2917; Ed: Asher

Not only Panini was by far the first linguist in recorded history, but I claim he was the first informaticien, 24 centuries before computers came into existence.

– Prof. Gérard Huet, Computer Scientist, Inria, Paris, in the Inaugural Speech at the First International Sanskrit Computational Linguistics Symposium, Paris, 29th october, 2007

Informatics in Aṣṭādhyāyī

From informatics point of view,
the importance of Aṣṭādhyāyī is two fold,

- ▶ The Structure of Aṣṭādhyāyī
- ▶ Method of Analysis of Sanskrit Language

Aṣṭādhyāyī

Aṣṭādhyāyī consists of around 4000 aphorisms with some ancillary texts.

- ▶ śivasūtras (special order of the phonemes)
- ▶ dhātupāṭha (list of verbal roots)
- ▶ gaṇapāṭha (various sets of nouns)
- ▶ liṅgānuṣāsanam (system for deciding the gender)
- ▶ uṇādi sūtras (?) (special rules)

śivasūtrāṇi

Normal Arrangement of Alphabet

Vowels	<i>a ā i ī u ū ṛ ṝ ḷ e ai o au aṃ aḥ</i>				
Vowels	अ आ ई उ ऊ ऋ ॠ ऌ ए ऐ ओ औ अं अः				
Velar	<i>ka</i>	<i>kha</i>	<i>ga</i>	<i>gha</i>	<i>ña</i>
Velar	क	ख	ग	घ	ङ
Palatal	<i>ca</i>	<i>cha</i>	<i>ja</i>	<i>jha</i>	<i>ña</i>
Palatal	च	छ	ज	झ	ञ
Retroflex	<i>ṭa</i>	<i>ṭha</i>	<i>ḍa</i>	<i>ḍha</i>	<i>ṇa</i>
Retroflex	ट	ठ	ड	ढ	ण
Dental	<i>ta</i>	<i>tha</i>	<i>da</i>	<i>dha</i>	<i>na</i>
Dental	त	थ	द	ध	न
Labial	<i>pa</i>	<i>pha</i>	<i>ba</i>	<i>bha</i>	<i>ma</i>
Labial	प	फ	ब	भ	म
semi-vowel	<i>ya</i>	<i>ra</i>	<i>la</i>	<i>va</i>	
	य	र	ल	व	

śivasūtrāṇi

Pāṇini rearranged the phonemes in the form of 14 ShivasUtras.

śivasūtrāṇi

1	<i>a i u</i> (<i>N</i>)	अ इ उ (ण)
2	<i>r</i> ! (<i>K</i>)	ऋ लृ (क)
3	<i>e o</i> (<i>N</i>)	ए ओ (ङ)
4	<i>ai au</i> (<i>C</i>)	ऐ औ (च)
5	<i>h y v r</i> (<i>T</i>)	ह्रय्वर् (ट)
6	<i>l</i> (<i>N</i>)	लृ (ण)
7	<i>ñ m ñ ṇ n</i> (<i>M</i>)	ञ्मङ्णन् (म)
8	<i>jh bh</i> (<i>Ñ</i>)	झभ (ञ)
9	<i>gh ḍh dh</i> (<i>S</i>)	घढध (ष)
10	<i>j b g ḍ d</i> (<i>S</i>)	जबगडद (श)
11	<i>kh ph ch ṭh th c ṭ t</i> (<i>V</i>)	खफछठथचट्टत (व)
12	<i>k p</i> (<i>Y</i>)	कप् (य)
13	<i>ś ṣ s</i> (<i>R</i>)	शषस (र)
14	<i>ha</i> (<i>L</i>)	ह्र (ल)

śivasūtrāṇi

The set *ac* (अच्)

1	<i>a i u</i> (<i>N</i>)	अ इ उ (ण)
2	<i>ṛ</i> (<i>K</i>)	ऋ लृ (क)
3	<i>e o</i> (<i>N</i>)	ए ओ (ङ)
4	<i>ai au</i> (<i>C</i>)	ऐ औ (च)
5	<i>h y v r</i> (<i>T</i>)	हृ यृ वृ रृ (ट)
6	<i>l</i> (<i>N</i>)	लृ (ण)
7	<i>ñ m ṇ ṇ n</i> (<i>M</i>)	ञ्म् ङ्णन् (म)
8	<i>jh bh</i> (<i>Ñ</i>)	झभ् (ञ)
9	<i>gh ḍh dh</i> (<i>Ṣ</i>)	घढ्ध (ष)
10	<i>j b g ḍ d</i> (<i>Ṣ</i>)	ज्बग्ङ्द (श)
11	<i>kh ph ch ṭh th c ṭ t</i> (<i>V</i>)	ख्फ्छ्ठ्थ्च्ट्त् (व)
12	<i>k p</i> (<i>Y</i>)	क्प (य)
13	<i>ś ṣ s</i> (<i>R</i>)	श्षस् (र)
14	<i>h</i> (<i>L</i>)	हृ (ल)

śivasūtrāṇi

The set *hal* (हल)

1	<i>a i u</i> (<i>N</i>)	अ इ उ (ण)
2	<i>ṛ</i> (<i>K</i>)	ऋ लृ (क)
3	<i>e o</i> (<i>N</i>)	ए ओ (ङ)
4	<i>ai au</i> (<i>C</i>)	ऐ औ (च)
5	<i>h y v r</i> (<i>T</i>)	ह्र य व र (ट)
6	<i>l</i> (<i>N</i>)	ल (ण)
7	<i>ñ m ṇ n</i> (<i>M</i>)	ञ म ङ ण न (म)
8	<i>jh bh</i> (<i>Ñ</i>)	झ भ (ञ)
9	<i>gh ḍh dh</i> (<i>Ṣ</i>)	घ ढ ध (ष)
10	<i>j b g ḍ d</i> (<i>Ṣ</i>)	ज ब ग ङ द (श)
11	<i>kh ph ch ṭh th c ṭ t</i> (<i>V</i>)	ख फ छ ठ थ च ट् त (व)
12	<i>k p</i> (<i>Y</i>)	क प (य)
13	<i>ś ṣ s</i> (<i>R</i>)	श ष स (र)
14	<i>h</i> (<i>L</i>)	ह्र (ल)

śivasūtrāṇi

The set *ik* (इक्)

1	<i>a i u</i> (<i>N</i>)	अ इ उ (ण)
2	<i>ṛ !</i> (<i>K</i>)	ऋ लृ (क)
3	<i>e o</i> (<i>N̄</i>)	ए ओ (ङ)
4	<i>ai au</i> (<i>C</i>)	ऐ औ (च)
5	<i>h y v r</i> (<i>T</i>)	हृ यृ वृ (ट)
6	<i>l</i> (<i>N</i>)	लृ (ण)
7	<i>ñ m ṇ ṇ n</i> (<i>M</i>)	ञ्म् ङ्णन् (म)
8	<i>jh bh</i> (<i>N̄</i>)	झभ् (ञ)
9	<i>gh ḍh dh</i> (<i>S</i>)	घढ्ध (ष)
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11	<i>kh ph ch ṭh th c ṭ t</i> (<i>V</i>)	ख्फ्छ्ठ्थ्च्ट्त् (व)
12	<i>k p</i> (<i>Y</i>)	क्प (य)
13	<i>ś ṣ s</i> (<i>R</i>)	श्षस् (र)
14	<i>h</i> (<i>L</i>)	हृ (ल)

śivasūtrāṇi

The set *yaN* (यण)

1	<i>a i u</i> (<i>N</i>)	अ इ उ (ण)
2	<i>ṛ</i> (<i>K</i>)	ऋ लृ (क)
3	<i>e o</i> (<i>Ṅ</i>)	ए ओ (ङ)
4	<i>ai au</i> (<i>C</i>)	ऐ औ (च)
5	<i>h y v r</i> (<i>T</i>)	ह्र य व र (ट)
6	<i>l</i> (<i>N</i>)	ल (ण)
7	<i>ñ m ṇ ṇ n</i> (<i>M</i>)	ञ म ङ ण न (म)
8	<i>jh bh</i> (<i>N̄</i>)	झ भ (ञ)
9	<i>gh ḍh dh</i> (<i>Ṣ</i>)	घ ढ ध (ष)
10	<i>j b g ḍ d</i> (<i>Ṣ</i>)	ज ब ग ङ द (श)
11	<i>kh ph ch ṭh th c ṭ t</i> (<i>V</i>)	ख फ छ ठ थ च ट् त (व)
12	<i>k p</i> (<i>Y</i>)	क प (य)
13	<i>ś ṣ s</i> (<i>R</i>)	श ष स (र)
14	<i>h</i> (<i>L</i>)	ह्र (ल)

Syntax of Aṣṭādhyāyī

iko yaṇaci (6.1.77)

इको यणचि (6.1.77)

ik{6} yaṇ{1} ac{7}

इक् {6} यण् {1} अच्

Syntax of Aṣṭādhyāyī

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ik{6} yaṇ{1} ac{7}
इक् {6} यण् {1} अच्

- ▶ *tasmin iti nirdiṣṭe pūrvasya* (1.1.65)
A word ending in locative case indicates 'of the preceding'.
- ▶ *ṣaṣṭhī sthāneyogā* (1.1.48)
A word in genitive case undergoes change.

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ik{6} ac{7} ::= yaṇ{1} ac{7}

इक् {6} अच्{7} :: = यण्{1} अच्{7}

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{i,u,r,!} {a,i,u,r,!,e,o,ai,au} → {y,v,r,!} {a,i,u,r,!,e,o,ai,au}

{इ उ ऋ ल्} {अ इ उ ऋ ल् ए ओ ऐ औ} → {य व र् ल्} {अ इ उ ऋ ल् ए ओ ऐ औ}

Other abbreviations

- ▶ ku (ka-varga : k,kh,g,gh,ṅ)
कु (क-वर्गः क् ख् ग् घ् ङ्)
- ▶ cu (ca-varga : c,ch,j,jh,ñ)
चु (च-वर्गः च् छ् ज् झ् ञ्)
- ▶ ṭu (ṭa-varga : ṭ,ṭh,ḍ,ḍh,ṇ)
टु (ट-वर्गः ट् ठ् ङ् ढ् ण्)
- ▶ tu (ta-varga: t,th,d,dh,n)
तु (त-वर्गः त् थ् द् ध् न्)
- ▶ pu (pa-varga: p,ph,b,bh,m)
पु (प-वर्गः प् फ् ब् भ् म्)

Other abbreviations

- ▶ sup : su, au, jas, am, auṭ, śas, ṭā, bhyām, bhis, ñe, bhyām, bhyas, ñsi, bhyām, bhyas, ñas, os, ām, ñi, os, sup

सुप् : सुँ-औ-जस्-अम्-औट्-शस्-टा-भ्याम्-भिस्-डे-भ्याम्-भ्यस्-डसिँ-भ्याम्-भ्यस्-डस्-ओस्-आम्-डि-ओस्-सुप्

- ▶ tip: tip, tas, jhi, sip, thas, tha, mip, vas, mas,ta, ātām, jha, thās, āthām, dhvam, iḍ, vahi, mahiñ

तिङ् : तिप्-तस्-झि-सिप्-थस्-थ-मिप्-वस्-मस्-त-आताम्-झ-थास्-आथाम्-ध्वम्-इङ्-वहि-महिङ्