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A STUDY ON THE CONTEXT OF PĀṆINI'S KĀRAKAS

by

David Ellis Rogers

A dissertation submitted in partial fulfillment
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ABSTRACT

A STUDY ON THE CONTEXT OF PĀṆINI'S KĀRAKAS

by

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Previous studies on the kārakas of Pāṇini's Aṣṭādhyāyī either have primarily discussed case-endings and secondarily presented a few of Pāṇini's definitions of the kāraka terms apādana, saṃpradāna (recipient), karaṇa (helper), adhikaraṇa (location), karman (object), kartṛ (agent) and hetu (cause) or have cited random sūtras which contain kāraka terms and describe a characteristic of a Sanskrit form. This study is an analysis of the method in which the kārakas operate in the generations of both Sanskrit words and Sanskrit expressions of verbal activities involving more than one entity.

Through an analysis of the pattern of generations of single words found in the literature the basic formal characteristics of the grammar are presented. This specification imposes rigor on the generations of verbal activities in which kāraka terms are employed. It is found that Pāṇini distinguished between the denotation of, the lexical

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representation of and the grammatical expression of an entity analyzed by the set of statements defining the kāraka terms. By means of formally-defined denotation Pāṇini's grammar is able to grammatically connect one generated form with the lexical representation of its denoted entity. It is concluded that by a process of direct generation of Sanskrit forms without any intervening positional movement of elements Pāṇini's grammar concerns itself with what we today call syntax and semantics.

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PREFACE

The primary purpose of this study was originally to analyze the set of statements defining the kārakas, the terms for the entities involved in a verbal activity. However, a continued interest in the methodology of Pāṇini's grammar resulted in the second chapter. It is hoped that this chapter is a basis for further specification of Pāṇini's grammatical technique. Comparisons with other grammatical models have been purposely avoided, for it is strongly felt that our understanding of the theoretical bases of Pāṇini's grammar is limited. For those who are not interested in the traditional survey of the problem found in dissertations the suggestion is to begin with the second chapter.

I would like to express my gratitude to everyone who has encouraged and helped me in the writing of this dissertation. In particular, I wish to express deepest feelings to Professor O. L. Chavarria-Aguilar, Chairman of the Department of Languages and Linguistics at the University of Rochester. While on the staff of the Linguistics Department of the University of Michigan, Professor Chavarria introduced me to Sanskrit and to Pāṇini's

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grammar. He has constantly encouraged by investigation into the grammar. Even when it became obvious that my work was leading nowhere, he was always generous of his time to graciously hear me out and to analyze a particular problem.

The many hours of fascinating discussions with Rama Sharma of the University of Rochester bears its mark on every page of this dissertation. I also wish to acknowledge the helpful insights and suggestions of George Woolley of Scientific Data Systems.

I am also indebted to my teachers, Paul Thieme and Padmanabh Jaini. I was also especially fortunate to have on my committee Professor Kenneth Hill who read the various versions with much care and who showed great interest in the substance of this dissertation.

If it were not for Mrs. Shirley Powell's excellent typing of this manuscript with great care, speed and accuracy this dissertation could never have been produced. Of course, for my wife Miriam, to whom fell the proofing of the final copy and whose unceasing support throughout my years at Michigan never failed, I cannot express my feelings.

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"Pāṇini's grammar is well worth being studied for its own sake; we do wrong if we use it only as a means for proving theories."

– Paul Thieme, Pāṇini and the Veda, p. xiii.

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CHAPTER I

INTRODUCTION

Survey of Literature on Pāṇini's Kārakas

There have been a number of works containing a considerable substantive discussion of what has been called Pāṇini's kārakas. The best of these were written in Sanskrit. There have also been numerous works in which the kārakas are either briefly presented or only mentioned in passing. These include many Western traditional grammars of Sanskrit and some Western works on various facets of Pāṇini's grammar. This survey of these previous discussions will be facilitated by the following presentation of some of the sūtras (or "statements"[1]) in which Pāṇini uses his kārakas.

In his Aṣṭādhyāyī[2] Pāṇini defines the kārakas

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[1]The word sūtra may be loosely translated as "statement." In this chapter the two words sūtra and statement are used interchangeably to avoid stylistic monotony; in the following chapter, however, a distinction is made between the two terms.

[2]The word Aṣṭādhyāyī, which means "eight books," is the name which was most probably later given to Pāṇini's grammar.

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in thirty-three contiguous sūtras. The first of these, sūtra 1.4.23,[1] is composed of the single word kārake, which may be translated as "when there is that which is doing (or making)." Because this statement, according to later commentaries, is understood in the following thirty-two sūtras, the term kārakas has been applied to the definienda of the following sūtras.

Sūtra 1.4.24, dhruvam apāye 'pādānam, states that "the fixed thing when there is removal is apādāna."[2] Whereas this sūtra contains both a definiens, "the fixed thing when there is removal," and a definiendum, "apādāna," sūtra 1.4.25 bhītrārthānāṃ bhayahetuḥ contains only a definiens stating "the cause for fear of the senses bhī ["fear"] and trā ["protect"]." Apādāna, the definiendum of the immediately preceding sūtra, is in force (anuvṛtti) in this sūtra. Thus the entire statement is "the cause for fear of the senses bhī ["fear"] and trā ["protect"] is apādāna." In like manner, sūtras

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[1]The numbers of the sūtras are in the format B.C.S., where B stands for the number of the book, the C for the number of the chapter within the book and the S for the number of the sūtra within the chapter. This numbering of the sūtras is also much later than Pāṇini, who lived about 600 B.C. On this, see Thieme 1935:128.

[2]Throughout this paper the definiens and definiendum of a sūtra will usually be placed in the English translation in the order in which they occur in the Sanskrit. The usual order is definiens followed by definiendum.

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1.4.26-31 each contain only a definiens with the definiendum apādāna from 1.4.25 in force.

Other definitions in this set of sūtras are the following:

1.4.32 karmaṇā yam abhipraiti sa saṃpradānam "that which one approaches by means of an object is recipient (saṃpradāna)"

1.4.42 sādhakatamaṃ karaṇam "that which is most effective is helper (karaṇa)"

1.4.45 ādhāro 'dhikaraṇam "the receptacle is location (adhikaraṇa)"

1.4.49 kartur īpsitatamaṃ karma "that which is most wished to be obtained by the agent is object (karman)"

1.4.54 svatantraḥ kartā "the independent one is agent (kartṛ)"

1.4.55 tatprayojako hetuśca "the instigator of that is cause (hetu) as well"

No examples relevant to his sūtras are directly attributed to Pāṇini, who probably lived in the sixth or seventh century B.C. in northwestern India (Abhyankar 1961:229). Illustrations were given during the oral discussions of a sūtra by teachers and students who had memorized the grammar. Orally transmitted from generation to generation, the grammar was eventually written down.[1]

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[1]Thieme (1956:10) points out that Kielhorn

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About 400 B.C. (Thieme 1956:2) Kātyāyana, a southerner, composed his vārttikas, which are investigations into the vṛtti ("procedure") of Pāṇini's grammar. The vārttikas are aphorisms which are additions or modifications to some of Pāṇini's sūtras. These vārttikas do not exist separately in early manuscripts. Franz Kielhorn distinguished them in his edition of the Mahābhāṣya (vol. 1 reissued as Abhyankar 1962b),[1] which was composed by Patañjali in the second century B.C. (Thieme 1956:2-3).[2]

The Mahābhāṣya is the basic commentary which provides examples in its discussions. However, Patañjali's aim is not to present a simple explanation of each of Pāṇini's sūtras. One of his purposes was "to defend Pāṇini against Kātyāyana, wherever Kātyāyana appeared to him unreasonable" (Misra 1966:26). Like Kātyāyana, however, he critically examines Pāṇini's sūtras to determine if they are logically sound.[3]

(1885:185-199) "gave more than 50 instances, where it can be proved that the text of Pāṇini's grammar was changed in one way or another by later tradition."

[1]He discusses his criterion for recognizing the vārttikas in Kielhorn 1876:6-7, 26, and 45-46.

[2]Thieme 1956:21-22 states that clearly in the case of Patañjali and probably in the case of Kātyāyana the grammar was written down, although both Patañjali and Kātyāyana visualized the original form of the grammar as spoken.

[3]In so doing Patañjali also quoted the kārikās, which were verses of earlier grammarians on Pāṇini's sūtras or Kātyāyana's vārttikas. See Kielhorn 1886:233.

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Both Patañjali and Kātyāyana,

> usually, do nothing but investigate the question whether a given formulation of Pāṇini ought to be changed, or supplemented, or altogether replaced by a different one. We are left to infer their idea of the meaning of Pāṇini's phrasing from the points raised by them in their critical discussion, which is all the more difficult since their mode of expression is often so terse that we are compelled to gauge, again by often complicated inferences, the motives underlying their objections against, or their defense of, Pāṇini's formulation (Thieme 1956:3).

It may be safely stated that the examples Patañjali uses in his discussion of a sūtra are primarily relevant to his argument and secondarily relevant to the sūtra under consideration. This may be seen in his discussion of sūtra 1.4.25, presented on page 6 below.

Like the entire Mahābhāṣya, there are three speakers in this dialogue or discussion. The first is the śiṣya "student," who attacks the sūtra under consideration; the second is the ācāryadeśīya "unaccomplished teacher," who in defending the sūtra "has some idea of the true state of the case but does not know the whole truth" (Kielhorn 1876:53); and the third is the ācārya "teacher," who in difficult cases (not in our example 1.4.25) gives "the final and correct view (Siddhānta) on the matter under discussion" (Kielhorn 1876:53). Although Patañjali did not tell us who was speaking, with the help of Patañjali 1967

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and following the procedure of Shefts 1961:17-44 the student is indicated by 1, the unaccomplished (or substitute) teacher by 2, and the teacher by 3. Translations of Sanskrit examples are enclosed in parentheses and my own interpolations are enclosed in square brackets. The following is Patañjali's discussion of sūtra 1.4.25 bhītrārthānāṃ bhayahetuḥ "the cause for fear of the senses bhī ["fear"] and trā ["protect"]" (Abhyankar 1962b:327-28).

2. It is possible to omit this rule.
1. How about "vṛkebhyo bibheti (he fears wolves), dasyubhyo bibheti (he fears Dasyus), caurebhyas trāyate (he protects from thieves), and dasyubhyas trāyate (he defends from the Dasyus)?"
2. This man, who is in the examples "vṛkebhyo bibheti (he fears wolves) and dasyubhyo bibheti (he fears Dasyus)," is doing so with previous deliberation; for he perceives "if the wolves see me, my death is fixed (dhruvam)." Undergoing this in his mind, he turns back. Therefore "dhruvam apāye 'pādānam (the fixed thing when there is removal is apādāna) [1.4.24]" itself is valid [effected].
This man, who is in the cases "caurebhyas trāyate (he protects from thieves) and dasyubhyas trāyate (he defends from the Dasyus)" becomes a friend, one who does with previous deliberation; for he perceives "if the thieves see this person, torments of killing or binding of him are certain (dhruvam)." Incurring this in his mind, he causes [them] to turn back. Therefore "dhruvam apāye 'pādānam (the fixed thing when there is removal is apādāna)" itself is valid.

In this dialogue the substitute teacher first states that sūtra 1.4.25 is really not necessary. The student, not satisfied that it can be omitted, brings up some examples which it should apply to. The sub-

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stitute teacher replies that the person in the expression vṛkebhyo bibheti "he fears wolves" (in which the verb is formed from the verbal root bhī) has realized that if the wolves see him, his death is a fixed thing. Consequently, he removes himself from that fixed thing and thus sūtra 1.4.24 "the fixed thing when there is removal is apādāna" applies to call the wolves apādāna and sūtra 1.4.25 "the cause for fear of the senses bhī ["fear"] and trā ["protect"]" is not necessary.

Patañjali's clever discussion is interesting; but, characteristic of most of his Mahābhāṣya, it is a study in semantics which is not systematically included in Pāṇini's grammar. Although the examples given are primarily relevant to his argument, in the context of the discussion they form the basis for our understanding the sūtra. However,

> quite often Patañjali looks at a question from different angles, shifting his point of view without giving notice, and proposing several solutions without settling on a definite answer. The later commentators take it for granted that Patañjali gives a final view (siddhānta) on every problem, and much dissent is caused by their disagreeing on whether a particular statement represents Patañjali's siddhānta or not (Thieme 1956:12).

One of the commentaries on Patañjali's Mahābhāṣya is the Mahābhāṣyapradīpa of Kaiyaṭa. Written in the eleventh century A.D., this work quite often helps in the interpretation of

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Patañjali's commentary. It, too, in turn had commentaries written on it. One of these was the Uddyota of Nāgeśabhaṭṭa, written early in the eighteenth century (Abhyankar 1961:119,76).

One of the most outwardly simple works on the Aṣṭādhyāyī is the Kāśikā, written in the seventh century A.D. by Vāmana and Jayāditya (Abhyankar 1961: 27).[1] Although based on previous grammatical works, primarily the Mahābhāṣya, the Kāśikā avoids the lengthy discussions of possible interpretations that characterize Patañjali's commentary; for its purpose is to present the least complicated explanation of each of Pāṇini's sūtras. Because the Kāśikā glosses the sūtra, presents examples, and mentions variant interpretations, it is an excellent introduction to Pāṇini's grammar, even though it may contain errors (Thieme 1956:12-13, 18). Its simplicity may be seen by comparing the translation of Patañjali's commentary on 1.4.25[2] with the following translation of the Kāśikā's discussion of 1.4.25,[3] bhītrārthānāṃ bhayahetuḥ "the cause for fear of the senses bhī

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[1]The following are two commentaries on the Kāśikā: the Nyāsa, written by Jinendrabuddhi in the eighth century A.D., and the Padamañjarī, written by Haradatta in the eleventh to twelfth century A.D. On these, see Misra 1966:27.

[2]Supra, p. 6.

[3]As in the translation of the Mahābhāṣya,

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["fear"] and trā ["protect"] (Miśra 1952:67).

> That kāraka which is the cause of fear in the use of the roots having the senses 'he fears' and 'he protects' is called [becomes the technical term] apādāna. [For example -] caurebhyo bibheti (he fears thieves) and caurebhya udvijate (he trembles because of (fears) thieves). Of the sense 'he protects' - caurebhyas trāyate (he protects from thieves), caurebhyo rakṣati (he defends (protects) from thieves). Why "the cause for fear"? [I.e., why is this mentioned in the sūtra?] - araṇye bibheti (he fears in the forest), araṇye trāyate (he protects in the forest).

Although it appears that the Kāśikā's discussion of 1.4.25 is based on the Mahābhāṣya, there are the following differences: (1) the Mahābhāṣya concludes that 1.4.25 is not necessary while the Kāśikā does not state this; and (2) Patañjali's commentary is more semantically oriented while the Kāśikā is focusing on the wording of the sūtra and, consequently, in its conclusion contrasts the examples already given with examples in which bhayahetuḥ "the cause for fear" is not present.

By studying the Mahābhāṣya's semantically-oriented discussions for semantic contrasts of phrases, words, and, especially, roots it may be possible to capture some of the native speaker's ability that is necessary for a study of the abstract elements (e.g.,

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translations of Sanskrit examples are enclosed in parentheses and my own interpolations are enclosed in square brackets.

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the verbal roots bhī and trā) functioning in Pāṇini's kārakas.[1] A study of the Kāśikā's glosses of sūtras and its examples contrasting with the ones covered by the sūtra under consideration further our understanding of Pāṇini's sūtras.

The works surveyed thus far have included the best substantive discussions of Pāṇini's kārakas. Besides these Sanskrit works there is some Western literature in which they are either briefly presented or only mentioned in passing. One of the better of these in the nineteenth century is Liebich 1886 which states that Pāṇini distinguishes six kārakas: kartṛ (agent), karman (object), saṃpradāna (recipient), karaṇa (helper), adhikaraṇa (location) and apādāna (208). However, rather than studying the kārakas as they are defined in the set of sūtras 1.4.23-55, Liebich focuses on the case-endings, which are specified in sūtras 2.3.1-73.

In his opening remarks Liebich points out that Pāṇini places at the head of his case teaching the

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[1] Thieme (1957:61) states that "Patañjali was in quite a different position from that of any later commentator. All the later commentators are not able to explain Pāṇini by confronting his rules with their own or others' living speech. They have learned Sanskrit in school and must consider correct what the grammar says. Hence they have no authority by which to settle the question whether the usage they infer by 'logical reasoning' is correct. . . . In contradistinction to all the later Pāṇinīyas, Patañjali knows Sanskrit as a living language."

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general rule (2.3.1) that a kāraka relationship comes into force only when that kāraka is not already expressed (in another part of the clause). Sūtra 2.3.2 states "when there is karman (object) - the second." For example, the second (accusative)[1] case-ending is used to denote the karman (object) when we form a sentence like kaṭaṃ karoti "he makes a mat," in which kaṭaṃ "mat" is the object. If one turns this sentence into the passive kriyate kaṭaḥ "a mat is made," then the relationship of the act of doing to the concept of the mat remains exactly the same because the karman (object) relationship is expressed in the passive of the verb and therefore the word for "mat" does not take the second (accusative) case-ending (Liebich 1886:208). The first (nominative) case-ending of kaṭaḥ is obtained by sūtra 2.3.46 prātipadikārthaliṅgaparimāṇavacanamātre prathamā "the nominative ending is added when there is to be designated nothing but the gender and the number of the nominal stem notion."[2]

In this article Liebich admits that "die beispiele zu den sūtra stammen aus der Kāśikā Vṛtti,

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[1]Pāṇini uses the terms prathamā (first), dvitīyā (second), tritīyā (third), caturthī (fourth), pañcamī (fifth), ṣaṣṭhī (sixth) and saptamī (seventh) for the case-endings respectively corresponding to the traditional Western terms nominative, accusative, instrumental, dative, ablative, genitive and locative.

[2]This is the translation of Thieme (1956:2). Liebich (1886:227) uses the Kāśikā's gloss prātipadika-

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beruhen also zunächst nur auf deren autorität" (207). However, in presenting the sūtras in the set 2.3.1-73 he does not just give glosses of sūtras and examples from the Kāśikā. Liebich attempts to discuss particular case-endings under separate subsections. In the titles of these subsections he cites contiguous sūtra numbers dealing with the particular case-ending under consideration. However, all of Pāṇini's sūtras enjoining one particular case-ending are not contiguously placed in the Aṣṭādhyāyī. Consequently, at the end of each subsection Liebich notes sūtras enjoining the same case-ending but placed in a different subsection. For example, under the subsection entitled "I. Accusativ (II, 3, 2-12)" he gives sūtras 2.3.2-5, which all enjoin the accusative under specified conditions, and then 2.3.6, which enjoins the instrumental under a particular condition (209-12). At the end of this subsection he lists references to other sūtras enjoining the accusative in other subsections of his article (for example, in the subsections on the dative and the instrumental). He does not explicitly discuss the interesting question why Pāṇini did not place together all sūtras enjoining one case-ending.

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arthamātre liṅgamātre parimāṇamātre vacanamātre prathamā vibhaktir bhavati "it becomes the first case-ending when the mere sense of the nominal stem, the mere gender, the mere size (or weight), the mere number," (Miśra 1952:117).

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Liebich also presents sūtras defining the kārakas at various points in his article. For instance, immediately after giving his translation of 2.3.2 karmaṇi dvitīyā "beim verbum steht der A zur bezeichnung des karman" (209)[1] he presents with examples the definitions of the object (karman) given in 1.4.49-53. Thus he was aware that there was a relationship between the sūtras defining the kārakas in the set 1.4.23-55 and those specifying the case-endings in the set 2.3.1-73. However, he does not discuss the nature of this relationship and, consequently, the theoretical basis for the two sets.

It was not until the twentieth century that the study of these two sets and their relationship was begun by Western students of the Aṣṭādhyāyī. The majority of nineteenth century Western grammars of Sanskrit were primarily concerned with case-endings and only briefly, if at all, presented the kārakas as a unit. For example, although Speijer 1886 is aware of the kārakas, he concentrates on the case-endings.

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[1] It should be noted that Liebich's translation of 2.3.2 is more restrictive than the literal translation "when object (karman) - the second." His translation that with a verb the accusative stands for the designation of the object (karman) would imply that with a participle it would not. It will be shown in Chapter III that this is not the case, rather that this sūtra, taken literally, assists in explaining forms occurring with non-verb forms such as participles.

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He mentions a sūtra number in the kāraka set only to indicate the source of a meaning that he attributes to the use of a case-ending.[1] He neither studies the relationship between the case-ending set and the kāraka set nor makes a systematic study of the relationships between the members of the kāraka set. That relationships between the members of the kāraka set must exist is implied by his statement that "in such sentences as 'the knife cuts,' the grammatical subject is both kartṛ (agent) and karaṇa (instrument)" (1). Not only does he not attempt to explain how "the knife" can be both kartṛ and karaṇa (a relationship between the members of the kāraka set), but he also does not attempt to explain the basis for selecting the case-ending (a function of (1) the relationships between the members of the case-ending set and (2) the relationships between the members of the kāraka set and (3) the relationship between the case-ending set and the kāraka set).

Although he does not study the relationships between the sūtras in the kāraka set, Faddegon 1936:18 does include cause (hetu) in 1.4.55 as a seventh kāraka. This is in contrast to Liebich,[2] Misra and Cardona.

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[1]For example, Speijer refers to sūtras 1.4.25, 27 and 28 on page 71 under his discussion of ablative.

[2]Supra, p. 10 for Liebich and supra, p. 3 for a literal translation of sūtra 1.4.55.

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Although Misra 1966 states that the "kāraka relationship is sixfold:" apādāna, sampradāna, adhikaraṇa, karma, karaṇa, and kartṛ (116); elsewhere he says that one of the "groups indicated by enumeration in the main body of the description" is the kāraka or "verbal relation" group of sūtras "1.4.24-55" (82), thus including the definition of cause (hetu), 1.4.55. Cardona 1967:207 considers six kārakas, excluding cause (hetu).

The status of this term is discussed in Rocher 1964b. Rocher's purpose is to illustrate that one should not "always follow blindly and uncritically the explanations of the Indian commentators" (31), as do Böhtlingk (1887) and Renou (1957).[1] Both Böhtlingk and Renou arrive at "a twofold definition of the term hetu: as a technical term, hetu indicates the agent of the causative form of a root; as a laukika ["occurring in ordinary life; common"] term, hetu has the general sense of 'cause'" (Rocher 1964b:31).

By the analysis of various sūtras Mme. Rocher refutes both these traditional views. She concludes that "in reality there is only one hetu, 'cause', a

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[1]Mme. Rocher is, e.g., referring to Böhtlingk's gloss of 1.4.55 on p. 37: "der diesen Antreibende heisst sowohl Kartṛ als auch Hetu (der Agens im Causativ)" and to Renou's entry for hetu on p. 350: "('cause') n. techn. selon I 4 55 du kāraka désignant la chose ou la personne qui fait faire l'acte (prayojaka), c'est-à-dire l'agent du verbe causatif. ... 'Cause' en general."

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technical term indicating as basic an element of the action as any other kāraka, without any difference whether the action is expressed by a causative or a non-causative verbal form" (33). She also concludes "that there is not a single sūtra in which the agent of the causative verb is actually called hetu, whereas in several instances this agent is explicitly referred to by the normal technical term for agent, namely kartṛ" (31).

In this last respect she cites sūtra 3.1.48 niśridrusrubhyaḥ kartari cāṅ [cleḥ 44][1] "in place of cli after ṇi, śri, dru or sru when there is agent - cāṅ," where śri, dru and sru are verbal roots and ṇi stands for the element ṇic that has been added either at 3.1.21 after certain denominatives, at 3.1.25 after certain forms or a verbal root of the tenth class, or at 3.1.26 in the sense of that which symbolizes cause (hetu). Thus she concludes that "the agent of the causative verb is in no way different from the agent of the aorists of śri, dru and sru in their non-causative forms" (32).[2]

Her argument is based on the premise that the form ṇi exists in the input to sūtra 3.1.48. Although it is implied by sūtra 3.1.48 itself that the input

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[1]In this paper an element that is anuvṛtti (in force) from a preceding sūtra and the number of that preceding sūtra are enclosed in square brackets.

[2]It is assumed that the element cli has been added during the formation of the aorist.

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does have the structure x cli, where x may be ṇi, śri, dru or sru; it is not shown that it can be. To show this would entail specifying the conditions under which ṇi and cli appear. Does ṇi (or śri, dru or sru) appear before or after cli appears? Would the order of the application of the sūtras which affix ṇi and cli give us additional insight into forms having ṇi? Also, can it be shown that there are causative forms of the verbal roots śri, dru and sru? The answers to such questions would also further our understanding of the Aṣṭādhyāyī as a system rather than as a collection of seemingly unordered sūtras.[1]

That the formal characteristics of the grammar are important is more evident when we consider the implications arising from a study of Mme. Rocher's following translation of sūtra 1.3.67, ṇer aṇau yat karma ṇau cet sa kartā 'nādhyāne: "except for the sense 'to remember', the ātmanepada ["middle"] terminations express the agent (kartṛ) related to a causative [ṇi] form, when the element[,] that was the object (karman) when related to the non-causative root [aṇi,] becomes the agent (kartṛ) when related to the causative form" (1964b:32-33).[2]

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[1]Or is William Dwight Whitney correct in asserting that "the prime object aimed at by him [Pāṇini] . . . is brevity, brevity at the cost of every other desirable thing - of theoretic truth, of connection, and, most of all, of intelligibility" (Whitney 1893:188-89)?

[2]Mme. Rocher offers no examples to this sūtra.

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The fact that Mme. Rocher uses the past tense in the clause that was the object (karman) when related to the non-causative root indicates that a previous operation may have occurred. Sūtra 1.3.67 specifies a comparison between apparently the input to 1.3.67 and a former state of that input; but neither 1.3.67 nor Mme. Rocher indicates if that former state is the input to the sūtra which is applied immediately before 1.3.67 or to an earlier sūtra.

Besides the question of the sequencing of the application of sūtras, we note that the terms karma and kartā in 1.3.67 are defined in the kāraka set 1.4.23-55. However, there is the following evidence that 1.3.67 itself is in a set of sūtras, 1.3.12-93, which specify conditions for the selection of either the ātmanepada or the parasmaipada conjugational endings.[1] Faddegon (1936:59-60), Misra 1966:85) and Rocher (1964a:48) imply this and in his discussion of sūtra 1.3.12 Vasu (1891:123) states that "the word 'atmanepada' here governs [is in force, is anuvṛtti in] all the subsequent sūtras up to sū. 77 inclusive." Vasu's presentation of 1.3.78-93 shows that these sūtras specify conditions for the selection, non-selection, or optional selection of the parasmaipada (159-166). Besides the use of the terms karman and

[1]The word atmanepada, meaning "word to one's self," has loosely been translated as "middle;" while the word parasmaipada, meaning "word for another," has loosely been translated as "active."

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and kartṛ in 1.3.67 there are other instances of kārakas being mentioned in this set 1.3.12-93; e.g. (1) in 1.3.13 bhāvakarmaṇoḥ one of the conditions for enjoining the ātmanepada is "when there is karman (object)" and (2) in 1.3.78 śeṣāt kartari parasmaipadam the parasmaipada is enjoined "when there is kartṛ (agent)." Thus it is obvious that there must be a relationship between a kāraka term in a sūtra in the ātmanepada-parasmaipada set 1.3.12-93 and the definition of that term in the kāraka set 1.4.23-55.

Besides such a relationship there is also the relationship which Liebich indicated,[1] the relationship between a kāraka term in the case-ending set 2.3.1-73 and the definition of that term in the set 1.4.23-55. However, we note in Mme. Rocher's discussion[2] that sūtra 3.1.48 contains the term kartṛ (agent) but is a member of neither the ātmanepada-parasmaipada set 1.3.12-93 nor the case-ending set 2.3.1-73. In 1964a Mme. Rocher also discusses other sūtras which contain kāraka terms and belong to neither the ātmanepada-parasmaipada nor the case-ending set.

As Mme. Rocher's approach in her article on the term hetu (cause) was "based upon a comparative examination of all sūtras dealing with the concept

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[1] Cf. supra, p. 13.

[2] Supra, p. 16.

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hetu, one after another" (1964b:37), so in 1964a Mme. Rocher discusses some of the sūtras in which Pāṇini uses the terms kartṛ (agent) and karman (object).

Except for mentioning in two footnotes in this article all but one of the other definitions of the object (karman) (1964a:47), Mme. Rocher refers only to the definitions of the agent (kartṛ) at 1.4.54 and the object (karman) at 1.4.49. Although she does not analyze the sūtras in the kāraka set 1.4.23-55, by citing other sūtras containing the terms kartṛ (agent) and karman (object) and by giving example sentences she indicates that the syntactic relationships of the agent (kartṛ) and the object (karman) may be expressed not only by the endings of inflected verb forms but also by different case-endings, by participial suffixes, by suffixes entering into the formation of derivatives and by compounds. However, she does not indicate how this is systematically done by the grammar. Such an explication would require a specification of the basic formal characteristics of the grammar.

Shefts 1961:4-5 presents sūtras 3.1.68-82, which specify that the agent (kartṛ) is expressed by affixes that are added after verbal roots and before a special kind of affix. She points out (5) that sūtra 3.1.79 enjoins the abstract element u when there is agent as in the string kṛñ u tip, from which the verb karoti "he makes" is formed. However, she does

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not explain the reason for the apparent redundancy of the agent being expressed both by the u and by the tip, a parasmaipada ending most probably enjoined by 1.3.78.[1]

A summary of Cardona 1967 will deepen our understanding and an analysis of it will raise some interesting questions. After a presentation of some generations of pronominal forms, Cardona states that in regard to Pāṇini's treatment of the kārakas "there are two sections: first 1.4.24-54, wherein kārakas are defined, then 2.3.2 ff. (and 3.4.67-75), wherein operations are introduced" (207).[2] He next gives the kāraka definitions 1.4.24, 32, 42, 45, 49 and 54[3] and then declares that "in 2.3.2 ff. rules are stated for introducing the triplets [each composed of a singular, dual and plural] given in 4.1.2 and referred to as 'first' (prathamā), 'second' (dvitīyā) etc." (207).[4] On the basis of this new information, that case-endings are enumerated at 4.1.2, it is now evident that the case-ending set 2.3.1-73 along with sūtras concerning number specify which case-ending given at 4.1.2 is to be selected.

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[1] Cf. supra, p. 19.

[2] It will be shown in Chapter II that the operations specified by 2.3.2 ff. and those specified by 3.4.67-75 are different.

[3] Cf. supra, pp. 2-3.

[4] Cf. supra, footnote 1, p. 11.

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Cardona points out that in sūtras 2.3.2 ff. case-marking (case-ending) triplets are introduced if, according to 2.3.1, the kāraka is not already expressed. However, he then adds that "practically, this refers to the expression of a kāraka by verb endings (. . . [18 conjugational endings]), primary suffixes (kṛt . . . [specified at 3.1.93 "kṛt is that which is not a conjugational ending"]) and others which are not directly pertinent to the present discussions." Cardona probably assumes that 2.3.1 refers to a primary suffix (kṛt) because, as he points out in his next sentence, by 3.4.67 "kṛt suffixes are assigned the function of expressing agent (kartṛ)" (208).

Assuming that by "2.3.2 ff." Cardona means 2.3.2-73, then 2.3.65 would be included in the sūtras specifying particular case-endings if the kāraka is, according to 2.3.1, not already expressed. However, there is an apparent contradiction in that sūtra 2.3.65, as Cardona mentions, states that "when a kṛt suffix is used the sixth triplet [genitive] is introduced to express kartṛ or karman" (208), but by 3.4.67 a kṛt already expresses the kartṛ (agent). This apparent contradiction is resolved in Chapter III by a more formal orientation (1) to the structure of a sūtra and to the context in which Pāṇini placed a particular sūtra in the grammar and (2) to the conventions of the grammar that apply during the genera-

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tion of words in an utterance.

Cardona (1967:209) points out that "Pāṇini's definitions of the kārakas are set up to condition later operations" in sūtras 2.3.2 ff. He notes that the locative case-ending is introduced by 2.3.36 saptamy-adhikaraṇe ca "the seventh [locative case-ending] when adhikaraṇa," which is defined by 1.4.45 ādhāro 'dhikaraṇam as the "substratum [locus, receptacle]" (207). This will account for the sentence pātāle tiṣṭhati "(she) is at the netherworld," where the verb is formed from the root sthā ["exist, stand"]. However, Cardona (1967:210) maintains that for the sentence pātālam adhitiṣṭhati, which he indicates has the same meaning as pātāle tiṣṭhati, Pāṇini has adjusted his definitions of the kārakas by defining object (karman) at 1.4.46 as "the locus of the activity expressed by sthā ["exist, stand"], used with preverb adhi" for the application of 2.3.2 "the second [accusative] when karman [object]."

Holding that this is an adjustment of the kāraka definitions to provide for the proper application of operational rules (2.3.2 ff.) leads one to the conclusion that, e.g., the sentences pātāle tiṣṭhati and pātālam adhitiṣṭhati have the same meaning. However, there is an argument that pātālam adhitiṣṭhati means "she inhabits (dwells in) the netherworld" and that this meaning is expressed in

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the grammar by the preverb adhi "over, upon" changing the inherent concepts "agent" and "bhāva"[1] in the root sthā to the concepts "agent" and "object." This allows subsequent operations to produce the passive sentence tayā pātālam adhisthīyate "the netherworld is inhabited by her," which could not be generated if the verbal root together with the preverb possessed the concept "bhāva" instead of "object." This is discussed in Chapter III.

That Cardona's aim is to accurately describe Pāṇini's grammar is evident. However, this cannot be said of the most recent work on the kārakas. The main interest of Kiparsky and Staal 1969 is evident beginning with the third sentence of their article: the kāraka "relations comprise such notions as have in the West been traditionally called 'logical subject-of', 'logical object-of', etc., and correspond to the 'underlying' or 'deep' syntactic relations of transformational grammar" (83). To show this statement to be valid is very worthwhile but requires that one

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[1]The translation of the term bhāva presents some difficulty. It literally means "becoming." Abhyankar (1961:270) says that "the word is used many times in the sense of dhātvartha - the sense of a root which is 'incomplete activity' or 'process of evolving.'" Rocher (1964a:48) states "Pāṇini indique par ce terme la seule occurrence d'un procès verbal, notamment sous les formes du passif impersonnel et du dérivé d'action." In this study bhāva will sometimes be glossed as "impersonal."

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first describes the system (grammar) of which the kārakas are a part.

As Kiparsky and Staal indicate, the fundamental problem to any adequate understanding of Pāṇini's grammar (or any grammar) is its system of "descriptive devices" (106) or formal characteristics. That this is necessary is evident from a consideration of the following points raised in the previous discussion of the literature on the kārakas.

1) There is disagreement on whether cause (hetu), defined in sūtra 1.4.55 is a seventh kāraka or not.[1]

2) From Mme. Rocher's discussion of sūtra 3.1.48[2] it appears that there are abstract elements cli and ṇi operating in the grammar. Since the affix ṇic is added at 3.1.26 when there is that which symbolizes cause (hetu), the order and character of the rules involving the generation of Sanskrit causatives may possibly give us insights into causative constructions in general.

3) If, as it appears from Mme. Rocher's discussion of 3.1.48, sūtras operate on abstract elements such as ṇi and cli and not on complete sentences, then is there a sūtra or convention stating the conditions

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[1] Supra, pp. 14-15.

[2] Supra, p. 16.

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for comparison of what appears to be two different states of abstract elements as indicated in 1.3.67[1] in the phrase the agent (kartṛ) related to a causative (ṇi) form, when the element, that was the object (karman) when related to the non-causative (aṇi) root, becomes the agent (kartṛ) when related to the causative form?

4) In her discussion of 1.3.67 Mme. Rocher does not show under what conditions the object in the non-causative becomes the agent in the causative.

5) Shefts 1961 does not explain the apparent redundancy of the agent being expressed in the string kṛñ u tip both by the u, enjoined by 3.1.79, and by the tip, a parasmaipada ending most probably enjoined by 1.3.78.[2]

6) In Cardona 1967 there is an apparent contradiction in that sūtra 2.3.65 states that "when a kṛt suffix is used the sixth triplet [genitive] is introduced to express kartṛ [agent] or karman" when, by 2.3.1, the kartṛ (agent) or karman is not already expressed; but by 3.4.67 a kṛt already expresses the agent (kartṛ).[3]

7) There has been no analysis of the sūtras

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[1] Supra, p. 18.

[2] Supra, pp. 20-21.

[3] Supra, p. 22.

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in the kāraka set 1.4.23-55 either in themselves or as they operate in the generations of words in an utterance. These sūtras can only be understood (a) as they contrast internally to other sūtras in the kāraka set and (b) as they are related externally during generations of words in an utterance.

8) The theoretical basis for the sūtras within the kāraka set 1.4.23-55 can only be discerned by their function in the generation of words in an utterance. For example, 1.4.46 states that "the receptacle (sphere) of the verbal roots sthā ["exist, stand"] śīn ["lie, rest"] or ās ["exist, sit"] with the preverb adhi ["over, upon"] is object (karman)." The basis for this sūtra is that (a) the verbal roots sthā, śīn and ās have only the concepts "agent" and "bhāva" but not the concept "object" inherent in them and (b) the preverb adhi modifies the sense of the root by replacing the concept "bhāva" by the concept "object" and thus changing the inherent concepts from "agent" and "bhāva" to "agent" and "object."[1] This sūtra allows for subsequent operations to produce the passive sentence tayā pātālam adhisthīyate "the netherworld is inhabited by her."

9) The fact that a kāraka term is used in the ātmanepada-parasmaipada set 1.3.12-93 and in the case-

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[1] Supra, pp. 23-24.

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ending set 2.3.1-73 leads us to believe that syntax is being presented. If the kāraka terms are also used in various sūtras such as 3.1.48[1] and, as Mme. Rocher maintains,[2] the syntactic relationships of the agent (kartṛ) and the object (karman) may be expressed not only by the endings of the inflected verb forms but also by different case-endings, by participial suffixes, by suffixes entering into the formation of derivatives and by compounds, then the sūtras should be invoked in an ordered, justifiable manner.

These syntactic and semantic functions of the kārakas can only be understood through an examination of their use in the generations of words in utterances. To Mme. Rocher's comparison of sūtras Cardona has supplemented contrastive examples of generations of utterances involving the kārakas. But the method of generation must be described if we are to rigorously deduce the theoretical foundation of not only the kārakas but eventually the entire grammar. The formal and substantive characteristics of the grammar should be empirically justifiable; that is, it should reflect a theory and explicate (to the best of our ability) the Sanskrit language. Then only, once these characteristics have been stated, can we fairly and

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[1] Supra, p. 16.

[2] Supra, p. 20.

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productively evaluate the Aṣṭādhyāyī and compare it with other grammatical models.

That this grammar merits analysis, evaluation and comparison is prompted by Leonard Bloomfield's comment (1929:268) that it "is one of the greatest monuments of human intelligence and . . . an indispensable model for the description of languages." If this is so, then an analysis of the kārakas is especially pertinent in light of Noam Chomsky's statement (1965:46) that "the most crucial problem for linguistic theory seems to be to abstract statements and generalizations from particular descriptively adequate grammars and, wherever possible, to attribute them to the general theory of linguistic structure, thus enriching this theory and imposing more structure on the schema for grammatical description."

The fundamental characteristics of this grammar are presented in Chapter II. This basic system imposes rigor on the analysis of the kārakas in generations of words given in Chapter III.

Survey of Previous Work on the Formal Characteristics of the Aṣṭādhyāyī

The following is a brief survey of former work done on the systematic features of Pāṇini's grammar. Although there is no outstanding work on this subject, many have stated important insights.

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Within the Indian tradition there rose a need to state certain principles which could help the student of the Aṣṭādhyāyī interpret sūtras and apply them in the explanation of a Sanskrit word. This was probably due not only to the passage of time and discontinuity in tradition (Misra 1966:33) but also to the influence of Patañjali, whose main interest was the analysis of a single sūtra at a time and not the method of generation of Sanskrit words.

The earliest collection of these principles (called paribhāṣās) in manuscript form is the Paribhāṣāsūcana of Vyāḍi, who is traditionally considered the first writer of grammatical paribhāṣās and prior to Patañjali (Abhyankar 1962a:Introduction p. 4). The most renown of the later paribhāṣā works is Nāgojībhaṭṭa's Paribhāṣenduśekhara, written in the early eighteenth century (Abhyankar 1961:225-26). In this collection and explanation of 133 paribhāṣās Nāgojibhaṭṭa tried to rely on Patañjali's Mahābhāṣya. He attempted "to show that those paribhāṣās that are not explicitly formulated or, at least, indicated or implied by some procedure of the Bhāṣya have 'no authority' and can be dispensed [sic] with" (Thieme 1957:57).

In his preface to his translation of and notes on the Paribhāṣenduśekhara Kielhorn offers no answer to the question whether the system of paribhāṣās in the Paribhāṣenduśekhara is adequate for the interpre-

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tation and application of Pāṇini's rules (Abhyankar 1960:xxiii). Misra (1966:33) maintains that a great number of these paribhāṣās "throw more light on the tradition of interpretation of Pāṇini than on Pāṇini himself." That these paribhāṣās do not comprise a rigorous system is especially evident in Abhyankar's discussion of the paribhāṣās which determine the priority of application in the case of sūtras which come into supposed conflict with one another during the generation of a word (Abhyankar 1962:Introduction pp. 24-31). This is primarily due to the misinterpretation of the scope of applicability of Pāṇini's sūtra 1.4.2.[1]

It may be that the paribhāṣās do not comprise a system because the traditional grammarians have concentrated on the Sanskrit language and have used the Aṣṭādhyāyī as a means to retain a working knowledge of Sanskrit. Focusing on Sanskrit forms, they have created paribhāṣās which assist them in explaining Sanskrit forms by means of the grammar rather than paribhāṣās which describe the means inherent in the grammar to generate many different kinds of Sanskrit forms by means of a few processes involving primitive elements (See Abhyankar 1962a:Introduction pp. 26, 31).[2]

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[1] Sūtra 1.4.2 is covered in Chapter II.

[2] Also cf. supra, footnote 1, p. 10.

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Although he does not adequately present the grammar's method of explanation, Faddegon 1936 does describe groups and sub-groups of sūtras.[1] One of these groups (or sets) is concentrated on in Buiskool 1939, in which many generations of words are given as examples of various points in the discussion. However, because its main concern is the order of application of sūtras relating to the tripādī (a name given to the last three chapters of the last book of the Aṣṭādhyāyī), there is no attempt to rigorously justify the selection of a sūtra in the previous part of the grammar.[2]

Although Shefts 1961 does not concern itself with the order of application of sūtras, it is the best English introduction to Pāṇini's grammatical method. This work includes an introduction, a text and translation of eighteen contiguous sūtras, a discussion of some pertinent technical terms, and edited and translated extracts from the Mahābhāṣya and the Kāśikā.

Misra 1966 fails to appreciate most of the important points at issue among the competing American linguistic schools and rather eclectically and inappropriately imposes some of these concepts on Pāṇini's

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[1] E.g., pp. 52-54, 59-60 and 64-67.

[2] E.g., pp. 52 and 68, where the selection and order of sūtras is determined on the basis of "the result that is to be arrived at."

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grammar. He concentrates on distinctions made in the grammar but does not show their relationships to each other or how they are used in the rules of the grammar. It would have been extremely useful to Western linguists if a man having the enormous training in the Pāṇinian tradition that Misra obviously possesses would have described the method of generating Sanskrit words by means of Pāṇini's model.

Cardona 1969 is both a descriptive study of the use of the śivasūtras (fourteen sūtras listing sounds) in Pāṇini's grammatical rules and a study comparing their use in Pāṇini's sūtras with rules of other Indian phonetic and morphophonemic treatises. Although this study contains many derivations, they are not formally justified. The general formal characteristics of the Aṣṭādhyāyī are not systematically presented.[1] However, Cardona does present certain fundamental sūtras (4-6), which he references later in his discussion. Although the majority of these sūtras are presented in Chapter II, they are approached somewhat differently.

This concludes a very brief survey of the most important previous works presenting information on the formal characteristics of Pāṇini's grammar. The following chapter not only draws example derivations from

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[1]Cf. p. 3, where he states that "this is not the occasion to describe the organization of the Aṣṭādhyāyī." However, throughout this study many important points are brought out.

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these works but also cites pertinent points raised in their discussions.

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CHAPTER II

BASIC FORMAL CHARACTERISTICS OF THE GRAMMAR

The purpose of this chapter is to present the basic formal characteristics of Pāṇini's grammar so that the kārakas may be placed in adequate context for subsequent examination in Chapter III. This chapter is neither a mathematical formalization of the Aṣṭādhyāyī nor even a complete description of the formal characteristics of the entire grammar. Certain problems that can only be resolved by much more analysis are presented and possible solutions along with their implications are noted.

After a description of the various kinds of statements, their contexts, in terms of the sets of which they are members, are presented. This is followed first by a description of the structure of a rule and then by a discussion of traffic rules (conventions ordering the applications of rules).

Kinds of Statements

An analysis of the sūtras in the Aṣṭādhyāyī is fundamental to an adequate understanding of the

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basic formal characteristics of the grammar. Since the sūtra is one of the primitive elements of the grammar, a description of its features not only is preliminary to the definition of a rule but also will consequently facilitate comparison of Pāṇini's grammar with other models.

One of the fundamental features of the sūtra is anuvṛtti (one or more terms from one or more preceding sūtras being considered in force (present) in a sūtra or sūtras). Although a thorough analysis leading to conventions concerning the use of anuvṛtti is necessary, it will not be undertaken in this paper. The interpretation provided in Miśra 1952 is the basis for the inclusion of terms as anuvṛtti in sūtras presented in this study.

Because some sūtras are incoherent without anuvṛtti of preceding term(s), this analysis of the kinds of statements in the Aṣṭādhyāyī concerns sūtras complete with any anuvṛtti. For this reason, the term statement will now be used to designate a sūtra with its anuvṛtti; while the term sūtra will be used to designate a sūtra without its anuvṛtti.

Before analyzing a representative sampling of the kinds of statements of the Aṣṭādhyāyī itself, mention of the main components of Pāṇini's grammatical system is in order. Besides the Aṣṭādhyāyī, ascribed to Pāṇini and composed of sūtras, there are the

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dhātupāṭha ("recitation of verbal roots"), the gaṇapāṭha ("recitation of classes" of elements which are not verbal roots) and the śivasūtras (sūtras which traditionally have been said to have been revealed to Pāṇini by the god Śiva). These three all consist of elements pertinently arranged so that they may be referenced as members of classes by sūtras of the Aṣṭādhyāyī.

While a class of elements in the dhātupāṭha or the gaṇapāṭha are referenced by a phrase in the format A etc., where A is the first element of the class; the means of referencing a class of elements in the śivasūtras is different. The explanation of this technique is momentarily postponed and the fourteen śivasūtras are simply presented here:

(Ś1.37)[1] a i u Ṇ

(Ś2.37) ṛ ḷ K

(Ś3.37) e o Ñ

(Ś4.37) ai au C

(Ś5.37) h y v r Ṭ

(Ś6.37) l Ṇ

(Ś7.37) ñ m ṅ ṇ n M

(Ś8.37) jh bh Ñ

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[1]To facilitate later reference the elements within parentheses are in the format Śn.p., where Ś stands for śivasūtra, n stands for the number of the śivasūtra and p stands for the page number of this paper on which it is located; e.g., (Ś1.37) stands for śivasūtra number one found on page 37.

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(ś9.38) gh ḍh dh ṣ

(ś10.38) j b g ḍ d ś

(ś11.38) kh ph ch ṭh th c ṭ t V

(ś12.38) k p Y

(ś13.38) ś ṣ s R

(ś14.38) h L

Specification of Notation

Many features of the statements of the Aṣṭādhyāyī appear self-evident, but some are explicitly specified by statements of the Aṣṭādhyāyī itself. These statements specify notational features. This is necessary because (1) some normal linguistic features of the Sanskrit language, such as sounds, case-endings and position of elements, have special purposes in the grammar; and (2) some terms in the grammar are not necessarily normal Sanskrit words.

(1.38)[1] 1.3.3 hal antyam [upadeśe it 2] "in the instruction a final consonant is an it"

The term upadeśe, anuvṛtti[2] from the preceding sūtra, refers not only to elements in certain sūtras

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[1]As with the śivasūtras, to facilitate later reference the numbers within parentheses are in the format n.p., where n stands for the number of the element under consideration and p stands for the page number of this paper on which it is located.

[2]In this paper an element that is anuvṛtti (in force) from a preceding sūtra and the number of that preceding sūtra are enclosed in square brackets.

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of the Aṣṭādhyāyī but also to the śivasūtras. Thus the final consonant of each śivasūtra is termed it, a technical term of the meta-language. In this paper the recognition of a symbol (sound) as an it will be indicated by capitalization. For example, in (Ś1.37) the capitalization of the Ṇ indicates that, according to (1.38) "in the instruction a final consonant is an it," the sound ṇ is an it.

Although other statements specify other sounds as its, for the sake of brevity these will not be given in this paper. Throughout this paper its will simply be indicated by capitalization.

(2.39) 1.1.71 ādir antyena sahetā [nirdiṣṭe 66 svaṃ rūpam 68] "when specification, an initial together with a final it is its own symbol"

This statement specifies that the initial of an element followed by an it which is the final of an element constitutes a technical term or name, which signifies both itself and any element of a list intervening between the initial and the it which is final. Thus the symbol so formed is the name of a set of elements.

This is the technique used in referencing the sounds specified in the śivasūtras. For example, the term iK is composed of an initial, the i of (Ś1.37), and an it which is the final of an element, the K of (Ś2.37). Thus the term ik refers to any of the sounds

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i, u, ṛ and ḷ and is therefore the name of the elements i, u, ṛ, ḷ. Likewise, the term aC, formed by an initial, and a of (Ś1.37), and the it C, which is the final of (Ś4.37), refers to any vowel; while the term haL used in (1.38), formed by the h of (Ś6.37) and the L of (Ś14.38), refers to any consonant. (The a of ha in haL is merely for pronunciation.)

(3.40) 1.1.70 taparas tatkālasya [nirdiṣṭe 66 svaṃ rūpam 68] "when specification of the time (length), that which is followed by t is its own symbol"

This statement specifies that that which is followed by the sound (symbol) t has only its own indicated length. For example, the symbol at signifies ă; īt, ī. Formally, this statement specifies (1) a syntactic structure of a symbol of the grammar: that (expressed by tat in the sūtra) followed by t and (2) the semantic interpretation of that (tad): its indicated length.[1]

(4.40) 1.1.49 ṣaṣṭhī sthāneyogā "the sixth (genitive) has the use 'in the place'"

Sūtra 1.1.49 specifies that the sixth (genitive) case-ending is to be interpreted as "in the place." Thus, if the term x in a sūtra is inflected in the genitive case, it is interpreted by (4.40) as "in the

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[1]Since this paper is on the kārakas and not on phonology, the distinction between short, long and extra-long will not be made in this paper.

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place x" and thus the term x is the substituendum. It should be noted that the Sanskrit sthāne "in the place" specifies a position and that the looser translation "in place of" focuses on the substituendum rather than the place (position).

(5.41) 1.1.66 tasminn iti nirdiṣṭe pūrvasya "'in that' when specification of the preceding"

Alternatively nirdiṣṭe pūrvasya may be translated as "when there is pointing to the preceding." It is interesting to note that tad "that," here inflected in the locative (tasmin), is chosen as a variable or symbol standing for a term in a sūtra, as it was in (3.40). Thus sūtra 1.1.66 specifies that the locative (seventh) case-ending is to be interpreted as "preceding;" e.g., x_7, "preceding x."[1]

(6.41) 1.1.67 tasmād ity uttarasya [nirdiṣṭe 66] "[lit.] 'from that' when specification of the following;" [i.e. the fifth case-ending signifies (specifies) "after"]

This statement specifies the interpretation of the ablative (fifth) case-ending as "following (after);" e.g., x_5, "after x." As in sūtra 1.1.66, tad "that," here inflected in the ablative (tasmāt), is used as a notational variable.[2]

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[1]In this paper a numerical subscript will be used to indicate the case-ending of an element. Thus, according to (4.40), x_6 is to be read as "in the place x."

[2]Cardona 1969:29 points out the use of pronominals as variables in rules such as 1.1.66 and 1.1.67.

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Because the use of tad as a variable in a sūtra is only implicitly understood and not explicitly specified by a statement of the Aṣṭādhyāyī, it should be stated as the following convention of the grammar:[1]

(C1.42) in a sūtra, the pronominal tad is a variable term.

Thus statements (4.40) 1.1.49, (5.41) 1.1.66 and (6.41) 1.1.67 respectively specify the position of the substituendum, the position preceding an element and the position following an element.

However, Pāṇini's grammar does not contain a statement explicitly specifying the case-ending marking the substituens. Generally speaking, in statements which prescribe an operation on data the term inflected in the nominative is considered the substituens. Thus it is implicitly understood (and therefore a convention of the grammar) that the first (nominative) case-ending signals the element under consideration (Misra 1966:103) or definiendum of the sūtra. This is stated in the following convention:

(C2.42) in a statement, the element inflected in the nominative (first) case is the element under consideration.

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[1]To facilitate later reference the elements within parentheses are in the format C.n.p., where C stands for convention, n stands for the number of the convention and p for the page number of this paper on which it is located.

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(7.43) 1.3.10 yathā saṃkhyam anudeśaḥ samānām "according to the enumerating is the assignment of equivalents"

This sūtra specifies that equivalence of elements are assigned according to the order in which they are enumerated. By inference, the elements being equivalently assigned are enumerated in a statement and are of the same number. Thus, if a statement contains the enumerations $a_1 \ldots a_n$ and $b_1 \ldots b_n$, then a_j is related to b_j, provided $1 \leq j \leq n$.

Sūtra 7.1.1 illustrates the notations specified by (4.40) and (7.43) and convention (C2.42). Thus, 7.1.1 yuvor anakau (yuvu$_6$ anaka$_1$) is interpreted as "in the place yu or vu - respectively an or aka" by (4.40) "the sixth (genitive) has the use 'in the place,'" (C2.42) "in a statement, the element inflected in the first (nominative) case-ending is the element under consideration" and (7.43) "according to the enumerating is the assignment of equivalents."

List of Elements

(8.43) 3.4.78 tip tas jhi sip thas tha mib vas mas ta atāṃ jha thās āthāṃ dhvam iḍ vahi mahiṄ "tiP tas JHi siP thas tha miP vas mas ta ātāṃ JHa thās āthāṃ dhvam iṬ vahi mahiṄ"

(9.43) 4.1.2 sv au jas am auṭ chaṣ ṭā bhyām bhis ṅe bhyām bhyas ṅasi bhyām bhyas ṅas os ām ṅy os sup "sU au Jas am auṬ Śas Ṭā bhyām bhis Ṅe bhyām bhyas ṄasI bhyām bhyas Ṅas os ām Ṅi os suP"

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Sūtra 3.4.78 is a list of eighteen elements, which may be considered conjugational endings; while sūtra 4.1.2 is a list of twenty-one elements, which may be considered declensional endings.[1] Because some terms have final its, a group of conjugational or declensional endings can be referenced by the technique specified at (2.39) "when specification, an initial together with a final it is its own symbol." Thus tiÑ and sUP respectively refer to any of the conjugational endings and any of the declensional endings. Likewise, taÑ refers to any of the last nine conjugational endings.

Assignment of Names

In addition to names of sets, e.g. tiÑ and taÑ, formed by (2.39) "when specification, an initial together with a final it is its own symbol," words are simply used as names of sets. For example, the following statement assigns the name vṛddhi to the set of elements ā, ai, au.

(10.44) 1.1.1 vṛddhir ād aic "vṛddhi is ā, ai, au"

The Sanskrit vṛddhir ād aic is interpreted

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[1]It should be noted that one of the conditions for a sound being an it is nasalization of a vowel. Since this is not marked in the texts, the absence of the nasalization of vowels in the forms JHi and JHa in 3.4.78 and its presence in the forms sU and NasI in 4.1.2 is here only hypothesized. This problem, however, is minor and will not affect our analysis of the kārakas.

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in the following manner to arrive at the translated gloss "vṛddhi is ā, ai, au." The term āt (the -d of ād < t by sandhi) is interpreted as ā by (3.40) "when specification of the time (length), that which is followed by t is its own symbol" and the term aic is interpreted as ai, au (see (Ś4.37)) by (1.38) "in the instruction, a final consonant is an it" and (2.39) "when specification, an initial together with a final it is its own symbol." It should be noted that the definiendum and definiens are reversed in (10.44).

(11.45) 1.1.2 ad eñ guṇaḥ "a, e, o is guṇa"

At is interpreted by (3.40) as a and eñ is interpreted by (1.38) and (2.39) as e, o.

(12.45) 1.4.100 taṅānāv ātmanepadam "taÑ, āna is ātmanepada"

In this sūtra the term taÑ is interpreted by (2.39) as any of the last nine elements listed at (8.43).

In the above sūtras a name (vṛddhi, guṇa, ātmanepada) specified in the definiendum of the sūtra stands for a set of elements specified in the definiens of the sūtra. It should be noted that technical terms, such as tiÑ, formed by (2.39) "when specification, an initial together with a final it is its own symbol" are names of sets of elements as are vṛddhi, guṇa and ātmanepada. Although (13.46) below is similar to (10.44) - (12.45), the name verbal root (dhātu) is

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assigned to each of the elements in the list headed by bhū rather than to the entire list.

(13.46) 1.3.1 bhūvādayo dhātavaḥ "bhū etc. are verbal roots"

In contrast to the above sūtras which in themselves assign names to elements without regard to any condition (more precisely are names of sets of elements), statements (14.46) - (17.46), (22.49) and (23.49) below assign names to data strings under the conditions specified in their respective definientia.

(14.46) 1.1.73 vṛddhir yasya acām ādis tad vṛddham "that of which the first of the vowels is vṛddhi is vṛddham"

Note that this sūtra contains another instance of the variable tad specified by (C1.42).

(15.46) 1.2.45 arthavad adhātur apratyayaḥ prātipadikam "that which has signification, not a verbal root, not an affix (pratyaya) is a nominal stem (prātipadika)"

(16.46) 1.2.46 kṛttaddhitasamāsāś ca [arthavad prātipadikam 45] "that which has signification, having a kṛt, taddhita or samāsa is a nominal stem (prātipadika)"

The terms kṛt, taddhita and samāsa are technical terms which may be loosely translated (but not technically defined by the grammar) respectively as "primary affix," "secondary affix" and "compound."

(17.46) 1.4.13 yasmāt pratyayavidhis tadādi pratyaye 'ṅgam "beginning with that (tad), after which there is

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an affix-operation (pratyayavidhi), before an affix (pratyaya) is a base (aṅga)"

This sūtra specifies that the name base is applied to element(s) on the basis of a pattern or syntactic condition, which can best be understood by an analysis of the sūtra itself. The term tad "that" is a variable according to (Cl.42). Tadādi means "beginning with that" or "that, etc." Thus it is specified that the pattern begins with a variable. Yasmāt, inflected in the ablative (fifth) case-ending, is interpreted by (6.41) as "after which," where the which refers to the variable expressed by tad in the sūtra. Pratyayavidhis may be loosely translated as "rule-enjoined affix (pratyaya)." Thus the pattern begins with a variable (tad) which must have a rule-enjoined affix after it. The term pratyaye, interpreted by (5.41) as "before an affix" specifies that the pattern ends before an affix and does not include that affix.

Where v is a verbal root and a is a rule-enjoined affix, if there are the elements v a in that order, then (17.46) specifies that the base (aṅga) begins with that after which there is a rule-enjoined affix and ends before an affix. The arrows in (18.47) indicate the pattern as specified by (17.46).

(18.47) $\downarrow_{v}\downarrow_{a}$

Thus the verbal root v is now called a base, as indi-

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cated in the following.

base
(19.48) v a

If, however, the initial state of the elements are v a b in that order, where v is a verbal root (and not an aṅga) and a and b are rule-enjoined affixes; then (20.48) indicates the structure (output) specified by (17.46).

base
(20.48) v a b

An application of (17.46) to (20.48) will result in (21.48), where the variable tad in (17.46) refers to the base of (20.48) and the two terms pratyayavidhis and pratyaya (affix) refer to two different affixes, respectively a and b.

base
(21.48) v a b

It should be noted that such an interpretation of (17.46) specifies the following operation. Both (1) if the variable (tad) under consideration in the input is a base and (2) if there is more than one affix to the right of that base under consideration in the input, then the affix immediately to the right of that base in the input is included in the resulting base; otherwise only the variable under consideration in the input is assigned the name base (provided it is not already called a base).

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However, there is possibly another interpretation of (17.46) 1.4.13. This results from interpreting pratyayavidhi not as "rule-enjoined affix" but rather as "operation(s) on an affix."[1] This would imply that operations concerning the affix must have been completed for 1.4.13 to be satisfied. Since this ambiguity can only be resolved by a detailed analysis concerning traffic rules, this study will translate pratyayavidhi as "affix-operation."

(22.49) 1.4.14 suptiṄantam padam "that which has a final sUP or tiṄ is a word (pada)"

Although the term pada is defined as that which ends in one of the conjugational endings listed at (8.43) or one of the declensional endings listed at (9.43), the grammar treats that to which it assigns the name pada more as a phonological entity than what Western linguists normally refer to by the term word.

(23.49) 3.1.32 sanādyantā dhātavaḥ "those which have final saN etc. are verbal roots"

This sūtra assigns the name verbal root to something under the condition that it ends in an element contained in a list headed by the element saN.

(24.49) 1.1.45 iṅg yaṇaḥ saṃprasāraṇam (iK$_1$ yaṆ$_6$

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[1]This possibility is pointed out by Mr. Rama Sharma of the University of Rochester.

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saṃprasāraṇa[1]) "i, u, ṛ, ḷ in the place of y, v, r, l is saṃprasāraṇa"

In addition to assigning names to data strings, statements also assign names to a replacement specification. For example, statement (24.49) above specifies that the term saṃprasāraṇa is a name for the replacement specification "i, u, ṛ or ḷ in the place of y, v, r or l."[1] It is important to note that such a sūtra both (1) assigns a name to a replacement specification and (2) specifies a condition-free replacement.

Thus, statements in themselves may assign names to a set of elements (e.g., "a, e, o is guṇa"), to data strings ("that which has a final sUP or tiÑ is a word (pada)"), or to a replacement specification ("i, u, ṛ or ḷ in the place y, v, r or l is saṃprasāraṇa").[2]

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[1]The Sanskrit ig yaṇaḥ is interpreted in the following manner to arrive at the translated gloss "i, u, ṛ, ḷ in the place of y, v, r, l." The term ik (the -g of ig < k by sandhi) is interpreted as i, u, ṛ, ḷ (see (Ś1.37) and (Ś2.37)) by (1.38) "in the instruction a final consonant is an it" and (2.39) "when specification, an initial with a final it is its own symbol." The term yaṇaḥ is inflected in the sixth case-ending and is thus interpreted by (4.40) "the sixth has the use 'in the place'" as "in the place yaṇ." The term yaṇ is in turn interpreted by (1.38) and (2.39) as y, v, r, l. (See (Ś5.37) and (Ś6.37).) Thus the term yaṇaḥ is interpreted as "in the place of y, v, r or l."

[2]There may be other kinds of name assignment by statements, but these have been observed as basic characteristics of the grammar.

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Specification of the Existence of a Term

Besides statements which specify notation, list elements, or assign names to sets of elements, to data strings or to replacement specifications; there are statements, such as the following, which specify the existence of a term on the basis of condition(s) specified in their respective definientia.

(25.51) 1.4.49 kartur īpsitatamaṃ karma "that which is most wished to be obtained by the agent (kartṛ) is object (karman)"

(26.51) 2.3.2 karmaṇi dvitīyā "when object (karman) - the accusative (second)"

(27.51) 1.3.13 bhāvakarmaṇoḥ [ātmanepadam 12] "when bhāva ("impersonal") or object - the ātmanepada"[1]

(28.51) 1.3.17 ner viśaḥ [ātmanepadam 12] "after ni viś - the ātmanepada"

Formally, (25.51) determines the term object (karman) if there is the condition "that which is most wished to be obtained by the agent"; (26.51) determines the term accusative if there exists an object. The condition for the determination (existence) of the term ātmanepada by (27.51) is the existence of one of the two terms bhāva ("impersonal") or object; while

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[1] The term bhāva may be loosely glossed as "impersonal." See supra, footnote 1, p. 24.

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the conditions for the term ātmanepada by (28.51) is the existence of the element ni followed by viś and the position under consideration is after ni viś.

Specification of Position, Condition or Name

Certain statements, such (29.52), only specify the syntactic feature of position; whereas others, such as (31.52) and (32.52), only specify a condition. Still others, such as (33.52), simply consist of a name.

(29.52) 3.1.2 paraśca "and follows"

(30.52) 3.1.91 dhātoḥ "after a verbal root"

(31.52) 1.4.23 kārake "when there is that which is doing"

(32.52) 2.3.1 anabhihite "when not placed (mentioned)"

(33.52) 3.1.1 pratyayaḥ "affix"

Specification of Placements

There are two basic requirements for the placement process in the grammar: a substituens (substitute) and the position of placement. In the following three statements, which are examples of placement specifications, the substituens is considered the definiendum. The placement may be conditioned as in the following two statements or non-conditioned as in (36.53).

(34.52) 1.1.51 ur aṇ raparaḥ "aN in the place ṛ is

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followed by r"

(35.53) 3.1.48 ṇiśridrusrubhyaḥ kartari cāṅ [cleḥ 44] "in the place cli after Ṇi, śri, dru or sru when there is agent - CaṄ"

In (34.52) the placement of r follows (is after) if there is the process of the replacement of ṛ by a, i, or u. In (35.53) the placement of CaṄ in place of cli occurs if there are the two conditions (1) ṇi, śri, dru or sru is after the placement position and (2) there is the existence of agent.

(36.53) 7.1.1 yuvor anakau (yuvu$_6$ anaka$_1$) "in the place yu or vu - an or aka"

This statement specifies a placement which is non-conditional in that it contains only alternative substituentia and the position of placement.

Specification of Characteristics of Replacements

Although the basic characteristics of the placement process, which have been mentioned above, are obvious, they should be stated in the following convention of the grammar:

(C3.53) the basic requirements for a placement process are (1) a substituens and (2) a position for placement.

Although the substituens may generally be considered by (C2.42) as the element inflected in the first case-

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ending as, e.g., in (36.53), and the position of placement may be indicated in, e.g., (36.53) by (4.40) "the sixth (genitive) has the use 'in the place,'" this is insufficient for placements which are replacements. Therefore certain statements of the Aṣṭādhyāyī itself specify characteristics of the replacement process.

(37.54) 1.1.50 sthāne 'ntaratamaḥ "in the place - the most similar"

Since antaratamaḥ "the most similar" is in the nominative (first) case, it may be taken to refer to the substituens by (C3.53) and (C2.42). Thus, if the substituendum (or, more correctly, place) is y and (24.49) "i, u, ṛ or ḷ in the place of y, v, r or l is samprasāraṇa" is under consideration for application, then (37.54) determines that of the possible substituentia i, u, ṛ, ḷ the most similar to the substituendum y is i. However, it may be argued that (7.43) "according to the enumerating is the assignment of equivalents" can be used to arrive at the same result; for y corresponds to i, v to u, r to ṛ, and l to ḷ.[1]

The resolution of this inconsistency in the domain of the interpretation of notation by (7.43)

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[1]The traditional example of the same inconsistency is in the application of sūtra 6.1.77 iko yaṇ aci (iK_6 yaN_1 aC_7). For a fuller presentation of this inconsistency see Cardona 1965a:313-14.

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"according to the enumerating is the assignment of equivalents" and by (37.54) "in the place - the most similar" requires examination of other statements which they interpret. Consider first (36.53) "in the place yu or vu - an or aka," to which (7.43) "according to the enumerating is the assignment of equivalents" applies nicely,[1] while there are no obvious criteria for determining an or aka most similar in respect to yu or vu. Thus, (7.43) applies to the elements in the statement which it is interpreting; but does it apply to the elements of the set which the names (or technical terms by (2.39)) iK and yaṆ stand for?

Consider statement 7.2.116 ata upadhāyāḥ [vṛddhiḥ 114 ñṇiti 115] (aT_6 $upadhā_6$ $vṛddhi_1$ $ÑṆit_7$) "in place of a which is penultimate, before that which has Ñ or Ṇ - vṛddhi" where the substituens is interpreted as the term vṛddhi by (C2.42) and the place is interpreted as the penultimate a by (4.40) "the sixth (genitive) has the use 'in the place.'" However, the term vṛddhi is, by (10.44), the set of elements ā, ai, au.

The substituens cannot be determined by (7.43) "according to the enumerating is the assignment of equivalents" but can be determined by first the interpretation of the term vṛddhi as the set of elements ā,

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[1]See also supra, p. 43.

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ai or au as specified by (10.44) and then the application of (37.54) "in the place - the most similar" in the comparison of the signification (here, phonetic features) of each of the terms ā, ai, au with a to determine ā the most similar to a.

However, it may be objected that in the above example (7.43) cannot apply since there is only one substituendum, a. Consider, then statement 7.2.115 aco ñṇiti [vṛddhiḥ 114] "in the place of aC, before that which has Ñ or Ṇ - vṛddhi." The term vṛddhi stands for (is a name for) the vowels ā, ai, au by (10.44); while the term aC stands for the vowels a, i, u, ṛ, ḷ, e, o, ai, au by (2.39). Here the terms vṛddhi and aC stand for an unequal number of vowels. Statement (7.43) could be applied if the enumeration continued so that ā is equivalent ṛ, ai to ḷ, au to e, etc. However, not only is this, e.g. ai in place of ḷ, not stated by commentary on 7.2.115 but it would seem to satisfy no purpose. On the other hand, on the basis of the phonetic features of the sounds (or the signification of the terms or semantic features of the signs), e.g., ā and not ai would be the most similar to ḷ.

Thus (7.43) "according to the enumerating is the assignment of equivalents" applies to the ordering of terms in a statement while (37.54) "in the place - the most similar" applies to the selection of the sub-

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stituens from elements (which a term may be a name for). It is important to note that the selectional process inherent in (37.54) is a comparison of the semantic features (signification) of the terms under consideration. Thus, in (24.49) i is the most similar to y because they both have the feature palatal. In this paper such semantic features of signs will be indicated by enclosure in square brackets and placement below the sign, as in the following:

$^{y}_{[palatal]}$ $^{i}_{[palatal]}$

(38.57) 1.1.56 sthānivad ādeśo 'nalvidhau "except in an operation on a sound, the substituens is like the substituendum"

This sūtra specifies that the substituens is like the substituendum except when the operation is on a particular sound. Thus, if some placement statement produces the string √v ṆvuL, where √v stands for verbal root, then the application of (36.53) "in the place yu or vu - (respectively) an or aka" will produce the string √v ṆakaL; that is, the nonphonological qualities of vu are retained in the resulting string, for the substituens is "like" the substituendum. These nonphonological qualities may include not only its but also semantic features (signification) of the particular substituendum. Thus, if before the application of (36.53) "in the place yu or vu - (respectively) an or

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aka" a rule imparts the signification agent to the sign ṆvuL in the string √v ṆvuL as indicated in the following,

(39.58) √v ṆvuL
[agent]

then by (36.53) "in the place yu or vu - (respectively) an or aka" with (38.57) "except in an operation on a sound, the substituens is like the substituendum" the substituens aka also has the signification agent as indicated in the following:

(40.58) √v ṆakaL
[agent]

Although the its Ṇ and L are qualities of the substituendum in the input (39.58), it may be better not to include them in the output (40.58). That the substituens aka also has these qualities could be indicated by a convention whereby the derivational history of a string could be referenced by an operational rule. Before continuing the discussion of this alternative it is necessary to present the following additional statements specifying characteristics of placement.

(41.58) 1.1.60 adarśanaṃ lopaḥ "lopa is non-appearance"[1]

(42.58) 1.1.61 pratyayasya [adarśanaṃ 60] lukślulupaḥ "luk, ślu or lup is non-appearance of an affix (pratyaya)"

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[1] In (41.58) - (43.59) the definiens is followed by the definiendum in the Sanskrit but is reversed in the English translations to comply with English usage.

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(43.59) 1.1.62 pratyayalope pratyayalakṣaṇam "there is the distinctive characteristic (quality) of the affix (pratyaya) when there is non-appearance (lopa) of the affix.

(44.59) 1.1.63 na lumatāṅgasya [pratyayalope pratyayalakṣaṇam 62] "there is not the distinctive characteristic of the affix (pratyaya) when there is non-appearance (lopa) of the affix of a base (aṅga) by luk, ślu or lup"

Although (41.58) and (42.58) define a more general sphere of application for lopa than for luk, ślu or lup;[1] the important difference is specified by (43.59) together with (44.59). The term lakṣaṇa in (43.59) may be translated as "mark, sign, attribute, quality, distinctive characteristic or that by which something is characterized (or recognized)." Thus (43.59) specifies that the distinctive characteristic of an affix remains when there is non-appearance of the affix, while (44.59) specifies that there is not the distinctive characteristic of an affix when there is non-appearance of the affix which is part of a base by luk, ślu or lup.

The interesting question is what determines the distinctive characteristic (lakṣaṇa) of an affix. Thieme 1956:6 paraphrases (43.59) as "in the disappearance of a suffix there remains its function;" while

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[1] It is left to be proved whether or not, except possibly for the l of ślu, the sounds of the terms luk, ślu and lup are its.

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Shefts 1961:12 paraphrases it as "'when there is invisibility of a suffix, the (nonphonetic) features of the suffix remain' [These nonphonetic features are: (1) its function; and (2) its effect on the phonetic features of other forms.]" Vasu 1891:57 states that "though an affix may be elided by lopa, yet an operation of which such an affix was the cause, must take place." It is obvious from the discussions of Thieme, Shefts and Vasu that the word function used by both Thieme and Shefts refers to the particular characteristic of the affix which is referred to in an operational statement. Thus the distinctive characteristic (lakṣaṇa) of the affix referred to in (43.59) is that by which the affix is recognized (and therefore the distinctive characteristic of the affix) in the operational statement.

For example, if an affix p has the its A and B and the signification s as in

$$(45.60) \quad x \quad \overset{p}{\underset{[s]}{AaB}}$$

where x is any element or elements and if some rule states that there is lopa (non-appearance) of that affix, then the resulting string is:

(46.60) x

If one of the conditions in a subsequent rule specifies any characteristic (e.g., A, B, [s]) of the affix which

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has been elided, then that rule will apply to (46.60) because (43.59) states that "there is the distinctive characteristic of the affix when there is non-appearance (lopa) of the affix."

However, if the affix p in (45.60) is elided by a rule specifying that there is luk, ślu or lup of that affix p of a base, then a subsequent rule specifying any characteristic (e.g., A, B, [s]) of that affix p will not apply to (46.60) because (44.59) states that "there is not the distinctive characteristic of the affix when there is non-appearance of the affix of a base by luk, ślu or lup."[1]

Lopa (non-appearance) has been presented as zero by Allen 1955:112; while lopa, luk, ślu and lup have been presented as zeroes by Pandit 1962:60-62. Also, as Shefts 1961:13, ftn. 17 points out,

> lopa, luk, ślu and lup are what Leonard Bloomfield referred to when he said (Language 209): '. . . the Hindus hit upon the apparently artificial but in practice eminently serviceable device of speaking of a zero element: in sheep : sheep the plural suffix is replaced by zero - that is, by nothing at all.' . . . There are several Sanskrit mathematical terms for zero - e.g., kha, śūnyam - but

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[1] One of the reasons traditionally given for the term pratyaya (affix) being in (17.46) "beginning with that (tad), after which there is an affix-operation, before an affix (pratyaya) is a base (aṅga)" is (44.59); i.e., if an affix has been elided by luk, ślu or lup, then the characteristic affix no longer exists to satisfy the condition affix of (17.46).

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lopa 'a breaking off, dropping off' is not one of them, and luk, ślu, and lup are solely grammatical terms.

Both Vasu 1891:342, 805 and Shefts 1961:12-13 indicate that the presence of luk, ślu or lup are themselves different conditions for later rules to apply. If this is so, then it would appear best to include them (and not zeroes) in the strings in the place of the affixes for which they are substituted. Thus, for example, if the affix p in (45.60) were replaced (elided) by luk, then (46.60) would appear as

(47.62) x luk

whereas if it were replaced by lopa, then (46.60) would appear as

(48.62) x A lopa B
p
[s]

However, if there were a convention of the grammar whereby the derivational history of a string or sub-string could be referenced by an operational rule,[1] except if the element in the string were luk, ślu or lup; then an alternative notation to (48.62) could be

(49.62) x lopa

However, since there is presently no reason to prefer (49.62) and the additional convention it requires, the

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[1]Cf. supra, p. 58, where there is a similar discussion concerning (39.58) and (40.58).

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notation of (48.62), which in itself contains the information necessary for subsequent rules, will be adopted at this point in our discussion.

The above discussion of certain statements which specify the characteristics of replacements completes this brief description of various kinds of statements in the Aṣṭādhyāyī. In summary, a sūtra with necessary anuvṛtti of terms may specify notational characteristics; may be a list of elements; may assign a name to a set of elements (define a set), to a data string, or to a replacement specification; may specify the existence of a term; may specify a position, condition or name; may specify placements of elements in a data string; or may specify characteristics of replacements.

An example of the specification of notation is (4.40) "the sixth (genitive) has the use 'in the place'" and an example of a list of elements is (9.43) sUP. A statement defining a set of elements is (11.45) "a, e, o is guṇa" and a statement assigning a name to a data string is (22.49) "that which has a final sUP or tiN is word (pada)." Statement (24.49) names the replacement specification "i, u, ṛ, or ḷ in the place of y, v, r or l" samprasāraṇa. An example of the specification of the existence of a term is (27.51) "when bhāva ("impersonal") or object (karman) - the ātmanepada." Sūtras (30.52) "after a verbal root," (31.52) "when there is that which is doing," and (33.52) "affix" respectively specify a position, condition and name;

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while (36.53) "in the place yu or vu - an or aka" specifies a placement and (37.54) "in the place - the most similar" specifies a characteristic of a replacement.

Because a sūtra may be incomplete without anuvṛtti of term(s) from preceding sūtra(s), may specify notational characteristics, may be simply a list of elements or the specification of a position, condition or name; a sūtra is not necessarily a "rule." Before discussing the structure of a "rule" in this grammar let us study sets of statements.

Sets of Statements

Faddegon 1936:54 points out that one of the characteristics of the Aṣṭādhyāyī is the arrangement of sūtras into groups and sub-groups, which, as Buiskool 1939:21 states, are "thematical, . . . the homogeneity of the sūtras consisting in their bearing on the same subject." Statements (41.58) - (44.59), for example, comprise a group or set of statements discussing a particular subject (topic), the interpretation of the non-appearance of elements. Other sets of statements, e.g. the ātmanepada-parasmaipada set 1.3.12-93, the kāraka set 1.4.23-55 and the case-ending set 2.3.1-73, are discussions of other topics. The following presentation of various topic-sets will place statements in the context of the topic of which

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they are a part (the set of which they are a member) and will facilitate the description of a rule and the description of traffic rules.

As far as the sūtra itself is concerned, its context is one or more terms being in force (anuvṛtti) from one or more preceding sūtras. For example, in sūtra (50.65) the term sārvadhātuke is anuvṛtti from statement 7.3.95. The terms ato dīrgho yañi of statement (50.65) are anuvṛtti in the next sūtra, (51.65).

It is important to distinguish the statement (a sūtra with its anuvṛtti), which has signification, from the sūtra itself. For example, the terms ato dīrgho yañi together with the term supi form the statement (51.65) ato dīrgho yañi supi "in the place a - the long before a yaÑ of a sUP" as opposed to the sūtra supi ca. In sūtra (52.66) the terms ato[1] and supi are anuvṛtti to form the statement (52.66).

(50.65) 7.3.101 ato dīrgho yañi [sārvadhātuke 95] (aT$_6$ dīrgha$_1$ yaÑ$_7$ sārvadhātuka$_7$) "in the place a - the long before y, v, r, l, ñ, m, ṅ, ṇ, n, jh or bh of a sārvadhātuka"

(51.65) 7.3.102 supi ca [ato dīrgho yañi 101] (aT$_6$ dirgha$_1$ yaÑ$_7$ sUP$_7$) "in the place a - the long, before y, v, r, l, ñ, m, ṅ,

---

[1]Whether the term ato is anuvṛtti in (52.66) from statement (50.65) or (51.65) or from sūtra (50.65) or (51.65) is a question which will not be approached here.

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ṇ, n, jh or bh of a declensional ending (one of the elements listed at (9.43))"

(52.66) 7.3.103 bahuvacane jhaly et [ato 101 supi 102] (bahuvacana$_7$ sUP$_7$ jhaL$_7$ eT$_1$ aT$_6$) "before jh, bh, gh, ḍh, dh, j, b, g, ḍ, d, kh, ph, ch, ṭh, th, c, ṭ, t, k, p, ś, ṣ, s or h of a plural declensional ending - e in the place a"

The contrastive significations of adjacent or nearly adjacent statements (not sūtras) form a small set of statements. For example, (51.65) is a statement specifying a placement before any declensional ending (sUP, cf. (9.43)); while (52.66) is a statement specifying a placement before, not any, but a plural declensional ending (specified by another statement as the last element of each group of three elements of (9.43)). Thus (51.65) is a general (utsarga) statement, whereas (52.66) is an apavāda statement, one which applies in a specific domain (plural) of the general statement (51.65).[1]

Another kind of signification which contrasts with another signification to form a small set of statements is a statement which specifies under a certain condition the negation of the signification of

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[1]Statement 7.3.103 is the beginning of a list of apavāda statements. For example, statement 7.3.104 specifies a placement before os, which is one of two specific members of sUP listed at (9.43).

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the preceding statement. For example, (44.59) 1.1.63 specifies a negation of the signification specified in (43.59) 1.1.62 under a certain condition: when it is of a base by luk, ślu or lup.

A third kind of signification which contrasts with another signification to form a small topic-set of statements is a statement specifying under a certain condition the optionality of the signification specified in the preceding statement. For example, statement 2.3.59 vibhāṣopasarge "optionally when a preverb (upasarga)" specifies that statement 2.3.58 divas tadarthasya [vyavahṛpaṇoḥ samarthayoḥ 57 karmaṇi 52 ṣaṣṭhī 50] "when object (karman) of the verbal root div having sense of 'exchange' or 'barter' - the genitive (sixth)" is optional under the condition "when there is an upasarga (preverb)."

These are only three kinds of contrastive significations of statements which form sets of statements. Because the identification of the boundaries of these sets depends on a complete specification of the conventions concerning anuvṛtti, the existence of such ill-defined sets is only noted here but is neither described nor presented.

There are also larger sets of statements which are characterized by heading statements. In this paper a statement S is considered a heading statement on the basis of (1) the semantic feature of the existence

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of the complete signification (as opposed to anuvṛtti of a term or terms) of that statement S in all non-heading statements of that set and (2) the syntactic feature of its being either initial in the set in which its signification holds or immediately after another heading statement of that same set. In the following presentation of sets of statements, heading statements will be prefaced by H and the set will be enclosed by a lefthand square bracket. For example, statements (50.65) - (52.66) are in a set of statements 6.4.1-7.4.97 headed by H6.4.1 aṅgasya "of a base (aṅga)." This set is depicted below.

(53.68)

H6.4.1 aṅgasya "of a base"

.
.
.

7.3.101 aT$_6$ dīrgha$_1$ yaÑ$_7$ sārvadhātuka$_7$ "in the place a - the long before y, v, . . . or bh of a sārvadhātuka"

7.3.102 aT$_6$ dīrgha$_1$ yaÑ$_7$ sUP$_7$ "in the place a - the long, before y, v, . . . or bh of sU, au, Jas . . . or suP"

7.3.103 bahuvacana$_7$ sUP$_7$ jhaL$_7$, eT$_1$ aT$_6$ "before jh, bh, . . . or h of Jas, Śas, . . . or suP - e in the place a"

.
.
.

7.4.97

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Miśra 1952:574 and 66-67 states that H6.4.1 aṅgasya "of a base" and H1.4.23 kārake "when there is that which is doing," which is the heading statement of the set of statements which is concentrated on in the next chapter, are adhikāra sūtras. Among the senses listed under its entry for adhikāra Monier-Williams 1899:20 includes "topic, subject; a paragraph or minor section; (in Gr.) government; a governing rule . . . ." The identification of these adhikāras (topics) is defined in the Aṣṭādhyāyī itself by sūtra 1.3.11 svaritenādhikāraḥ "by a high-low pitch is an adhikāra (topic)." Unfortunately there is no orthographic expression of accentuation in the manuscripts of the Aṣṭādhyāyī. Thieme 1935:121 states that "the accentuation of Pāṇini's grammar was lost at a time prior to Patañjali."[1]

Every statement called a heading statement in this paper may not have marked, according to 1.3.11, a topic (adhikāra) in the original rendition of the Aṣṭādhyāyī. Evidence for this is sūtra 1.4.1 ā kaḍārād ekā saṃjñā "as far as kaḍāra [2.2.38] - one term," which in this paper is considered a heading-sūtra because (1) the domain of the signification "one term" is overtly specified as 1.4.1-2.2.38 and (2) it is initial in the set 1.4.1-2.2.38. Miśra 1952 does not call 1.4.1 an adhikāra sūtra (63) but does call others

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[1] Cf. supra, footnote 2, p. 4.

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in the set 1.4.1-2.2.38 adhikāra sūtras (78, 83, 85).

The set 1.4.1-2.2.38 also has another heading statement in addition to Hl.4.1. This is Hl.4.2 vipratiṣedhe paraṃ kāryam "when there is conflict the last is to be done." The domain of the signification "when there is conflict the last is to be done" is specified by Hl.4.1 as "as far as kaḍāra [2.2.38]." The traditional interpretation of the domain of 1.4.2 is much larger than the set 1.4.1-2.2.38. Miśra 1952:63 under 1.4.2 states that the selection of (52.66) 7.3.103 instead of (51.65) 7.3.102 is justified by 1.4.2 "when there is conflict the last is to be done." This analysis, however, considers there to be no vipratiṣedha "conflict," but rather that statement (52.66) is selected because it applies in a specific domain, the plural declensional ending, of the general domain, the declensional ending, which is stated in (51.65).

Heading statement 1.4.2 "when there is conflict the last is to be done" points out the distinction between the anuvṛtti of one or more terms and the signification of a heading statement, which was specified above in one criterion for a statement being considered a heading statement.[1] The importance of statement Hl.4.2 "when there is conflict the last is to be done" will be discussed in Chapter III.

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[1] Cf. supra, pp. 67-68.

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The major features of the set of statements 1.4.1-2.2.38 are presented in the following summary (54.72), which includes subsets other than the kāraka set 1.4.23-55. Other subsets are 1.4.56-98, which is about particles (nipātas), and 2.1.3-2.2.38,[1] which is about compounds. According to Hl.4.56 "as far as riśvara [1.4.97] - particles (nipātas)" the topic of the statements 1.4.56-98 is particles. This is indicated by the fact that the term nipātāḥ, inflected in the first (nominative) case, agrees in case with the definienda of the non-heading statements of the set 1.4.56-98. For example, both nipātāḥ and the definiendum of both statements 1.4.97 and 1.4.98, adhir, are inflected in the first (nominative) case. Thus the term adhi is a member of the particle (nipāta) set. However, there is also the set 1.4.83-98, which is included in the sets 1.4.56-98 and 1.4.1-2.2.38. In Hl.4.83 the term karmapravacanīyās, also inflected in the first (nominative) case, agrees with the definienda of the non-heading statements of the set it heads, 1.4.83-98. Thus, the definiendum of statements 1.4.97 and 98, adhir, receives the signification of Hl.4.83, "karmapravacanīya," because it agrees in case-ending with Hl.4.83 karmapravacanīyās. Thus the

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[1] It is probable that this subset begins with 2.1.1. H2.1.3 is shown here because it overtly states the domain (i.e., as far as 2.2.38).

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term adhir in statements 1.4.97 and 98 is a member of the nipāta set according to Hl.4.56 and a member of the karmapravacanīya set according to Hl.4.83.

(54.72)

Hl.4.1 ā kaḍārād ekā saṃjñā "as far as kaḍāra [2.2.38] - one term"

Hl.4.2 vipratiṣedhe paraṃ kāryam "when there is conflict the last is to be done"

1.4.13 yasmāt pratyayavidhis tadādi pratyaye 'ṅgam "beginning with that (tad), after which there is an affix-operation, before an affix (pratyaya) is a base (aṅga)"

1.4.14 suptiṅantam padam "that which has a final sUP or tiN is word (pada)"

Hl.4.23 kārake "when there is that which is doing" [signification in force thru 1.4.55]

1.4.42 sādhakatamaṃ karaṇam "that which is most efficient is helper (karaṇa)"

1.4.49 kartur īpsitatamaṃ karma "that which is most wished to be obtained by the agent is object (karman)"

1.4.54 svatantraḥ kartā "the independent is agent (kartṛ)"

1.4.55

Hl.4.56 prāg rīśvarān nipātāḥ (prāk riśvara$_5$ nipāta$_1$) "as far as riśvara [1.4.97] - particles (nipātas)"

Hl.4.83 karmapravacanīyāḥ (karmapravacanīya$_1$) "karmapravacanīyas"

1.4.97 adhir īśvare (adhi$_1$ īśvara$_7$) "adhi - when lord"

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1.4.98 vibhāṣā kṛñi [adhir 97] "optionally adhi - before verbal root kṛÑ"

1.4.99 laḥ parasmaipadam "in the place of L is parasmaipadam"

1.4.100 tānānāv ātmanepadam "taÑ, āna is ātmanepada"

1.4.101 tīnas trīṇi trīṇi prathamamadhyamottamāḥ "the three triplets of tiÑ [elements listed at 3.4.78] are third person, second person, first person (respectively)"

1.4.102 tāny ekavacanadvivacanabahuvacanāny ekaśaḥ [tīnas trīṇi trīṇi 101] "those elements of each triplet of tiÑ [elements listed at 3.4.78] are, one by one - singular, dual, plural"

1.4.103 supaḥ [trīṇi trīṇi 101 tāny ekavacanadvivacanabahuvacanāny ekaśaḥ 102] "those elements of each triplet of sUP [elements listed at 4.1.2] are, one by one - singular, dual, plural"

1.4.108 śeṣe prathamaḥ "in the remainder [i.e., other than those conditions specified by 105-107] - third person"

H2.1.3 prāk kaḍārāt samāsaḥ "as far as kaḍāra [2.2.38] - compound (samāsa)"

2.2.38

In addition to sets of statements which have heading statements there are sets of statements not having heading statements but generally indicated both by commentary and by its subject matter to be a set. The ātmanepada-parasmaipada set 1.3.12-93, some of the statements of which are presented in (55.74) below, is

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an example of such a set. There are the following features in this set: (1) a statement specifies the signification of a term;[1] (2) particular roots with any preverb are under consideration in the definientia (e.g., 1.3.17, 19); (3) a particular class of roots is identified by accent or it (e.g., 1.3.12, 72); and (4) if the conditions specified in the definientia of 1.3.14-77 do not hold, then 1.3.78 is satisfied when there is agent.

(55.74)

1.3.12 anudāttañita ātmanepadam "after that which has low pitch or an ñ as it - the ātmanepada"

1.3.13 bhāvakarmaṇoḥ [ātmanepadam 12] "when bhāva or object (karman) - the ātmanepada"

1.3.17 ner viśaḥ [ātmanepadam 12] "after viś preceded by ni - the ātmanepada"

1.3.19 viparābhyāṃ jeḥ [ātmanepadam 12] "after vi or parā [followed by verbal root] ji - the ātmanepada"

1.3.67 ner aṇau yat karma ṇau cet sa kartānādhyāne [ātmanepadam 12] "after Ni, if that which in non-Ni is object in Ni is agent (kartṛ), when not 'remember' - the ātmanepada"

1.3.72 svaritañitaḥ kartrabhiprāye kriyāphale [ātmanepadam 12] "after that which has a high-low pitch of ñ as it, when the fruit of the action is intended for the agent - the ātmanepada"

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[1] Cf. supra, (27.51) and (28.51).

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1.3.74 ṇicaśca [kartrabhiprāye kriyāphale 72] [ātmanepadam 12] "after ṆiC, when the fruit of the action is intended for the agent - the ātmanepada"

1.3.78 śeṣāt kartari parasmaipadam "after the remainder [i.e., other than those specified by 1.3.14-77], when agent - the parasmaipada"

1.3.86 budhayudhanaśajaneṅprudrusrubhyo neṭ [parasmaipadam 78] "after [the verbal roots] budhA 'know,' yudhA 'fight,' naśA 'perish,' janA 'be born,' . . . [followed by] Ṇi - the parasmaipada"

Some of the statements in the case-ending set 2.3.1-73 are presented below in (56.76). The statements in this set appear not to be placed together according to definienda. For example, the instrumental (third) case-ending is enjoined by 2.3.6, 18, 19 and 23; while between 2.3.6 and 2.3.23 not only is the accusative (second) enjoined by 2.3.8 and 12 but the dative (fourth) and ablative (fifth) are also respectively enjoined at 2.3.12-13 and 10-11. Also, 2.3.12 enjoins either the accusative or the dative case-ending. Instead of arrangement by definienda the case-ending set appears to be arranged by statements grouped together according to some feature specified in their definientia. For example, 2.3.5-6 concerns time or distance, while 2.3.8-11 concerns the presence of an element called karmapravacanīya. Thus, the statements are arranged not according to definienda but according to contrastive definientia (conditions for the selection of a term).

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(56.76)

H2.3.1 anabhihite "when not placed"

2.3.2 karmaṇi dvitīyā "when object (karman) - the accusative (second)"

2.3.5 kālādhvanor atyantasaṃyoge [dvitīyā 2] "when unbroken connection of time or distance - the accusative (second)"

2.3.6 apavarge tṛtīyā [kālādhvanor 5] "when completion of time or distance - the instrumental (third)"

2.3.8 karmapravacanīyayukte dvitīyā "when connected with a karmapravacanīya - the accusative (second)"

2.3.10 pañcamy apāṅparibhiḥ [karmapravacanīyayukte 8] "when connected with the karmapravacanīya apa, ā, or pari - the ablative (fifth)"

2.3.11 pratinidhipratidāne ca yasmāt [karmapravacanīyayukte 8 pañcamy 10] "after whatever when connected with a karmapravacanīya when there is substitution or exchange - the ablative (fifth)"

2.3.12 gatyarthakarmaṇi dvitīyācaturthyau ceṣṭāyām anadhvani "when object or sense of motion - the accusative or the dative (fourth) when moving the limbs, but not when distance"

2.3.13 caturthī saṃpradāne "the dative (fourth) - when recipient (saṃpradāna)"

2.3.18 kartṛkaraṇayos tṛtīyā "when agent (kartṛ) or helper (karaṇa) - the instrumental (third)"

2.3.19 sahayukte 'pradhāne [tṛtīyā 18] "when connected with saha ["with"], when not principal (i.e., subordinate) - the instrumental (third)"

2.3.23 hetau [tṛtīyā 18] "when cause (hetu) - the instrumental (third)"

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2.3.24 akartary ṛne pañcamī [hetau 23] "when cause (hetu), when not agent, when debt - the ablative (fifth)"

2.3.26 ṣaṣṭhī hetuprayoge "the genitive (sixth) - when employment with hetu"

2.3.28 apādāne pañcamī "when apādāna - the ablative (fifth)"

2.3.36 saptamy adhikaraṇe ca [dūrāntikārthebhyo 35] "the locative (seventh) - after senses 'distant' or 'near' as well as when location (adhikaraṇa)"

2.3.46 prātipadikārthaliṅgaparimāṇavacanamātre prathamā "when there is to be designated nothing but the gender and the number of the sense of the nominal stem (prātipadika) - the nominative (first)"

2.3.55 āśiṣi nāthaḥ [karmaṇi 52 ṣaṣṭhī 50] "when object (karman) of [verbal root] nāth, when benediction - the genitive (sixth)"

2.3.58 divas tadarthasya [vyavahṛpaṇoḥ samarthayoḥ 57 karmaṇi 52 ṣaṣṭhī 50] "when object of the verbal root div having sense of 'exchange' or 'barter' - the genitive"

2.3.59 vibhāṣopasarge "optionally [statement 58] when a preverb (upasarga)"

2.3.65 kartṛkarmaṇoḥ kṛti [ṣaṣṭhī 50] "when agent or object, when primary affix (kṛt) - the genitive (sixth)"

2.3.66 ubhayaprāptau karmaṇi [kṛti 65 ṣaṣṭhī 50] "when there is occurrence of both [agent and object], when there is primary affix (kṛt); [then] the genitive when [signifies] object"

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Three more observations on the case-ending set presented above should be made before passing on to the next set of statements. First, a statement containing only a kāraka K as a condition in its definiens precedes a statement containing that kāraka K and one or more conditions in its definiens. For example, the definiens of 2.3.2 contains only the condition "when object (karman)," but 2.3.55 has not only the condition "when object" but also the conditions "after the verbal root nāth" and "when benediction." Thus if all three conditions of 2.3.55 are satisfied, then it must be chosen over 2.3.2 which has only one of these conditions. The second observation is that the output of the case-ending set (56.76) is a term, e.g. accusative (second), with a signification, e.g. "object," specified by the definiens of the statement selected, e.g. 2.3.2 karmaṇi dvitīyā (26.51). Lastly, the signification of the heading statement 2.3.1 anabhihite, "when not placed," exists in statements 2.3.2-73. Thus, if the term with a certain signification specified in a definiens is placed, it cannot be chosen; conversely, if the term with a certain signification specified in a definiens is not placed, it can be chosen.

Some of the statements 2.4.1-85, which immediately follow the case-ending set 2.3.1-73, are presented below in (57.79). These are in the subset 2.4.36-85, which is concerned with what may be loosely called suppletion.

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The statements 2.4.46, 71, 72 and 75 are specification of placements, similar to those discussed above on pp. 52-53. The characteristics of these placement statements are specified by notational statements (4.40), (5.41), (6.41), (42.58) and (44.59).

(57.79)

2.4.36

2.4.46 ṇau gamirabodhane [iṇo 45] "before Ni, when not understanding (perceiving) - gam in the place of iN"

2.4.71 supo dhātuprātipadikayoḥ [luk 58] "in the place sUP of a verbal root (dhātu) or nominal stem (prātipadika) - luk"

2.4.72 adiprabhṛtibhyaḥ śapaḥ [luk 58] "after adI etc. [verbal roots of the so-called second class] in the place ŚaP - luk"

2.4.75 juhotyādibhyaḥ śluḥ [śapaḥ 72] "after juhoti [hu] etc. [verbal roots of the so-called third class] in the place ŚaP - ślu"

2.4.85

The next large set of statements, some main features of which are shown in (58.80) below, is 3.1.1-5.4.160, in which the majority of statements specify placements. This set is headed by (33.52) 3.1.1 pratyayaḥ "affix,"[1] the signification of which indicates that in the set 3.1.1-5.4.160 in a statement specifying a placement the definiendum (substituens),

[1]Miśra 1952:142 states that 3.1.1 pratyayaḥ "affix" is an adhikāra (topic).

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which is inflected in the nominative (first) case (as is pratyayaḥ in 3.1.1), is assigned the name affix (pratyaya). Heading statement (29.52) 3.1.2 paraśca "and follows" signifies that the affix follows. It should be noted at this point in the discussion that there is no indication what it follows. The next two heading statements of the set 3.1.1-5.4.160 specify that the affix has high pitch on its first syllable unless it is either a sUP (declensional endings listed at (9.43) 4.1.2) or has P as an it, in which case it is low pitch.[1] The traditional interpretation is that the signification of these heading statements holds from the beginning of the third book to the end of the fifth book.

(58.80)

H3.1.1 pratyayaḥ (pratyaya$_1$) "affix"

H3.1.2 paraśca "and follows"

H3.1.3 ādyudattaśca "and has high pitch on first (syllable)"

H3.1.4 anudāttau suppitau "[but] sUP or that which has P as it is low-pitched"

H3.1.91 dhātoḥ (dhātu$_5$) "after a verbal root"

H3.1.92 tatropapadaṃ saptamīstham "here, that which is referred to by the term in the seventh (locative) case is upapada ("subjoined")"

H3.1.93 kṛt atiṅ "primary affix (kṛt) is that which

[1] H3.1.4 is apavāda to (applies in a specific domain of) H3.1.3.

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is not a tiN̄ [list of elements at 3.4.78]"

H3.1.94 vā 'sarūpo 'striyām "optional is that which does not have same [phonetic] form, but not when feminine"

3.1.133 ṇvultṛcau (ṇvultṛc$_1$) "ṆvuL or tṛC"

3.1.135 igupadhajñāprīkiraḥ kaḥ (iKupadhajñāprīkṝ$_5$ Ka$_1$) "after penultimate i, u or ṛ or verbal roots jñā (know), prī (please) or kṝ (scatter) - Ka"

3.2.1 karmaṇy aṇ (karman$_7$ aṆ$_1$) "when object (karman) - aṆ"

3.4.78 tip tas jhi sip . . . mahiṅ [tiN̄, cf. (8.43)]

3.4.117

5.4.160

The affix set (58.80) has two large subsets of statements. The first subset begins at 3.1.91 and ends at 3.4.117, the last statement of the third book. The first of the four heading statements of this set is (30.52) 3.1.91 dhātoḥ (dhātu$_5$), which, according to (6.41), specifies the position after a verbal root and which Miśra 1952:159 states should be taken as an adhikāra (topic).

The next statement, 3.1.92, signifies that here, in this subset, that which is referred to by a term inflected with the seventh (locative) case-ending is called upapada[1] (Miśra 1952:159). This heading state-

[1]Cardona 1967:213 translates upapada as "subjoined"; Faddegon 1936:29, "secondary"; Abhyankar 1961:79, "lit.a word placed near; an adjoining word";

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ment specifies a relationship between a form of the object language being generated and what it refers to.[1] For example, together with non-heading statement 3.2.1 heading statement 3.1.92 specifies a relationship between two forms of the object language being generated. For in statement 3.2.1 karman$_7$ aṆ$_1$ "when object (karman) - aṆ," that which is the referent indicated by the object language string aṆ has the signification (concept) "object" and is called upapada. It should be noted that the term upapada is a technical term or name for the entity or the string (form) referred to by the term inflected in the seventh case. Although it is not explicitly specified which string (verbal root or affix) has the referent, this study assumes that it is the entire string composed of verbal root and affix while the affix (e.g., aṆ) indicates that there is the referent. Thus, if there is the activity of making (verbal root kṛ) a kumbha- "pot" where kumbha- has the signification "object" (karman)

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and Vasu 1891:382, "dependent." As with all these terms, however, the best translation is based on an interpretation of how the grammar treats that which it calls upapada. It may be that because the grammar was oral rather than written the term upapada is merely a name given to something by which it can later be referenced. Thus, as a part of the grammar the symbol upapada probably has no other signification than this.

[1]It appears that it is not necessary for the referent to be lexically represented by another form (string) in a generation.

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and 3.2.1 is selected, then by H3.1.92 that, (kumbha- "pot"), which is indicated by its signification "object" (karman) being in the seventh case in 3.2.1 (karman$_7$ aṆ$_1$), is the referent of kṛ aṆ, the output string. The following alternative notations will represent this relationship. First, the translation of the Sanskrit term in the seventh (locative) case may be placed in parentheses under the string having the referent which has that concept as in the following.

(59.83)

kṛ aṆ	kumbha
(object)	[object]

Alternatively, the notation ↴ represents that the element pointed to is upapada, or the referent, according to H3.1.92, as in the following.

(60.83)



Since the signification of H3.1.1 pratyayaḥ "affix" exists in the subset 3.1.91-3.4.117, the signification of the third heading statement of this subset is that an affix (1) which is both a definiendum and a substituens in the set 3.1.91-3.4.117 and (2) which is not one of the elements (affixes, according to H3.1.1) listed at (8.43) 3.4.78 is called a primary affix (kṛt).

The last heading statement of the verbal root set 3.1.91-3.4.117 specifies that that affix,[1] provided

[1]The signification "affix" holds from H3.1.1 pratyaya "affix."

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it is not feminine, which does not have the same phonetic form (i.e., without considering its) is optional. For example, the phonetic form (vu or tr) of the affixes specified at 3.1.133 nvultrcau (nvultrc$_1$) "NvuL or trC" are both different from the phonetic form (a) of the affix Ka specified at 3.1.135 igupadhajñāprīkiraḥ kaḥ "after penultimate i, u or r or verbal roots jñā (know), prī (please) or kr̄ (scatter) - Ka." Since the signification of H3.1.91 dhātoḥ "after a verbal root" holds in 3.1.133 and 135, the affixes NvuL, trC or Ka come after a verbal root. Although 3.1.135 "after penultimate i, u, or r or verbal roots jñā, prī or kr̄ - Ka" is traditionally considered apavāda to (applying in a specific domain of) the general (utsarga) statement 3.1.133 because it specifies particular conditions (after penultimate i, u, or r or verbal roots jñā, prī or kr̄) on the input verbal root whereas 3.1.133 "NvuL or trC" with the signification of H3.1.91 "after a verbal root" does not; H3.1.94 signifies that NvuL or trC of the general statement 3.1.133 may optionally be selected even if the particular conditions on the verbal root stated in the definiens of the apavāda statement 3.1.135 are satisfied. Thus, if the input is the verbal root ksip (which satisfies 3.1.135), there may be selected the apavāda statement 3.1.135 resulting in ksip Ka or, optionally, the definiendum of the general statement 3.1.133 resulting in ksip NvuL or ksip trC. However, if the

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affixes (e.g., aṆ and Ka) in the general statement and the apavāda statement have the same phonetic form (e.g., a), then there is no optionality by H3.1.94 "optional is that which does not have the same [phonetic] form, but not when feminine." Thus H3.1.94 is a heading statement which provides traffic information concerning the non-heading placement statements of the set it heads. (61.85)

H3.1.1 pratyayaḥ (pratyaya$_1$) "affix"
H3.1.2 paraśca "and follows"
H3.1.3 ādyudattaśca "and has high-pitch on first (syllable)"
H3.1.4 anudāttau suppitau "[but] sUP or that which has P as it is low-pitched"
H3.1.91 dhātoḥ (dhātu$_5$) "after a verbal root"
3.4.117 [last statement of Book 3]
H4.1.1 Ṅyāpprātipadikāt (Ṅiāpprātipadika$_5$) "after Ṅi, āP or nominal stem (prātipadika)"
4.1.2 sv au jas am . . . sup [sUP, cf. (9.43)]
5.4.160 [last statement of Book 5]

The second large subset of statements within the affix set 3.1.1-5.4.160 is the subset 4.1.1-5.4.160, the main features which this study will utilize are shown in (61.85). This set is headed by the statement 4.1.1 Ṅyāpprātipadikāt "after Ṅi, āP or nominal stem." The elements listed at (9.43), loosely called declensional endings, immediately follow this heading

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statement. It should be noted that the domain of the signification of H3.1.1-4 includes subset 4.1.1-5.4.160. Because we shall be concerned in this study with only the first two statements of this set, other statements and subsets of the set 4.1.1-5.4.160 will not be presented.

The majority of the remaining statements of the Aṣṭādhyāyī, 6.1.1-8.4.68 are generally phonological in nature and therefore will not be discussed here. They have been subdivided into groups by Faddegon 1936:53, 54, 65 and 66 and Buiskool 1939:19, 20 and 58-63. The groups which will be relevant in our discussion of traffic rules are 6.1.1-157, which are general phonological statements, and 6.4.1-7.4.97, which is headed by the topic (adhikāra) sūtra aṅgasya "of a base."[1]

In summary, the sūtras of the Aṣṭādhyāyī are arranged in topics or sets of statements, where a statement is defined as a sūtra with its anuvṛtti. Sets of statements may contain subsets. Small sets of statements are characterized by the signification of a statement B contrasting with the signification of a previous (adjacent or near) statement A in different ways. For example, the signification of statement B may apply in a specific domain of the general domain specified by statement A, may specify under a certain condition the negation of the signification of

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[1]Cf. supra, (53.68).

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statement A, or may specify optionality under a certain condition.

A set (subset) may or may not have heading statements, where a statement S is considered a heading statement on the basis of (1) the semantic feature of the existence of the complete signification (as opposed to anuvṛtti of a term or terms) of that statement S in all non-heading statements of that set and (2) the syntactic feature of its being either initial in the set in which its signification holds or immediately after another heading statement of that same set. The heading statements, together with their sets which were discussed above, are presented in (62.87) below, which will be referred to in the following sections on rule construction and on traffic rules.

(62.87)

1.2.45	"that which has signification, not a verbal root, not an affix (pratyaya) is a nominal stem (prātipadika)"
1.2.46	"that which has signification, having a primary affix (kṛt), secondary affix or compound is a nominal stem"
1.3.12 1.3.93	Ātmanepada-parasmaipada set, statements of which specify the existence of a term.
Hl.4.1	"as far as 2.2.38 (inclusive) - one term"
Hl.4.2	"when there is conflict the last is to be done"
1.4.13	"beginning with that, after which there is an affix-operation, before an affix is a base (aṅga)"
1.4.14	"that which has a final sUP or tiṄ is word (pada)"
Hl.4.23	"when there is that which is doing."
1.4.55 2.2.38	Kāraka set, statements of which specify the existence of a term.

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H2.3.1 "when not placed." Case-ending set, statements of which specify the existence of a
2.3.73 term.

2.4.36 Specifying replacements, these statements may loosely be considered to specify
2.4.85 suppletion.

H3.1.1 pratyaya$_1$ "affix"
H3.1.2 "and follows"
H3.1.3 "and has high pitch on first (syllable)"
H3.1.4 "[but] sUP or that which has P as it is low-pitched"
H3.1.91 dhātu$_5$ "after a verbal root"
H3.1.92 "here, that which is referred to by the term in the seventh case is upapada"
H3.1.93 "primary affix (kṛt) is that which is not a tiÑ [elements at 3.4.78]"
H3.1.94 "optional is that which does not have same [phonetic] form, but not when feminine"
3.4.78 "tiP tas JHi siP . . . mahiÑ"
3.4.117

H4.1.1 "after ṄīṄ, āP or nominal stem (prātipadika)"
4.1.2 "sU au Jas am . . . suP"
5.4.160

6.1.1-157 general phonological statements

H6.4.1 "of a base (āṅga)"
7.1.101 "in the place a - the long before y, v, . . . or bh of a sārvadhātuka"
7.4.97

The signification of some heading statements is specifically connected to certain terms in the non-heading statements of the particular set they head. In the case of H3.1.1 pratyaya$_1$ "affix" the first case-ending determines that the substituentia of the non-heading statements of the set 3.1.1-5.4.160 belong to the set of affixes.

Heading statements may also specify position.

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Although the first heading statements of each of the two large subsets within the affix set 3.1.1-5.4.160 clearly specify position, H3.1.91 stating "after a verbal root" and H4.1.1 specifying "after N̄ī, āP or nominal stem"; there is no indication what the affixes in statements 3.1.5-90 follow, for H3.1.2 simply states "and follows."[1]

While H3.1.3-4 specify pitch of the affixes in the affix set and H3.1.93 assigns the name primary affix (kṛt) to all affixes in the set 3.1.91-3.4.117 except those listed at (8.43) 3.4.78 (tiN̄), heading statements 3.1.92 "here, that which is referred to by the term in the seventh (locative) case is upapada" specifies a relationship between a form in the object language being generated and something to which that form refers. H3.1.94 "optional is that which does not have same [phonetic] form, but not when feminine" provides traffic information concerning the non-heading placement statements of the set 3.1.91-3.4.117.

Besides heading statements, the sets in themselves have some interesting general characteristics. The majority of non-heading statements from 2.4.36 to the end of the grammar specify placements. Those placement statements from 6.1.1 to the end of the grammar are generally phonological in nature. The majority of

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[1]This indeterminacy will be returned to in the discussion of traffic rules.

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the affix set 3.1.1-5.4.160 are statements specifying placements of affixes after something. The set 2.4.36-85, positionally above the affix set, contains statements specifying replacements of affixes in a string. There are some placement statements, e.g. (24.49) 1.1.45 "i, u, ṛ, ḷ in the place of y, v, r, l is samprasāraṇa," which are positionally above 2.4.36.

The statements in the ātmanepada-parasmaipada set 1.3.12-93, the kāraka set 1.4.23-55 and the case-ending set 2.3.1-73 specify the existence of a term (symbol in the meta-language). For example, (27.51) 1.3.13 specifies that the term ātmanepada exists if there is either bhāva ("impersonal") or object (karman); (25.51) 1.4.49 specifies the existence of the term object if there is "that which is most wished to be obtained by the agent;" and (26.51) 2.3.2 specifies the existence of the term accusative (second) if there exists object. The relationships between terms in different sets, such as the term object as a condition for the existence of a term in a statement in the case-ending set and the specification of the existence of the term object in the kāraka set, and also the significance of the various sets will be discussed in the following section and in the section on traffic rules.

Rule Construction

Because a statement may specify notational characteristics; may be a list of elements; may non-

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conditionally or conditionally assign a name to an element or elements; may specify the existence of a term; may specify a position, condition or name; or may specify placements of elements in a data string;[1] statements are not necessarily rules.

One argument in the formation of a rule is the signification of heading statements. As is evident from (58.80), statement 3.1.133 ṇvultṛcau (ṇvultṛc$_1$) "ṆvuL or tṛC" is a member of the set 3.1.91-3.4.117 and of the larger set with the heading statements 3.1.1-4 "affix, and follows, and has high pitch on first (syllable) but sUP or that which has P as it is low-pitched." Statement 3.1.133 receives the signification not only of H3.1.1-4, but also that of H3.1.91 "after a verbal root," H3.1.92 "that which is referred to by the term in the seventh case is upapada," and H3.1.93 "primary affix (kṛt) is that which is not a tiN̄."[2] With the information from these heading statements, statement 3.1.133 "ṆvuL or tṛC," which by itself is a list of elements, becomes the following rule specifying a placement: "after a verbal root - the affix ṆvuL or tṛC, [either of which] has high pitch on first

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[1] *Supra*, pp. 38-64.

[2] Since H3.1.94 "optional is that which does not have same [phonetic] form, but not when feminine" is a traffic statement, we assume in our discussion that statement 3.1.133 has already been selected for application.

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syllable and is a primary affix." The components of this rule are expressed in the following.

(63.92)

H3.1.1	(pratyaya$_1$) "affix"
H3.1.2	"and follows"
H3.1.3	"and has high pitch on first syllable"
H3.1.4	"[but] sUP or that which has P as it is low-pitched"
H3.1.91	(dhātu$_5$) "after a verbal root"
H3.1.92	"here, that which is referred to by the term in the seventh (locative) case is upapada"
H3.1.93	"primary affix (kṛt) is that which is not a tiÑ"
3.1.133	"ṆvuL or tṛC"

In a rule (the rule above being composed of statements 3.1.133, H3.1.91-93 and H3.1.1-4), there are sometimes notational features which are specified (given signification) by other statements. Thus (6.41) 1.1.67 "the fifth (ablative) case-ending signifies 'after'" interprets the fifth case-ending of H3.1.91 dhātu$_5$, in the above rule, as having the signification "after" in relation to the word dhātu "verbal root."

Similarly, a statement sometimes contains a term, the signification of which is specified by another statement. Consider, for example, the following.

(64.92) 3.3.72 hvaḥ samprasāraṇaṃ ca nyabhyupaviṣu [aP 57] "when [preverbs] ni, abhi, upa or vi - aP and there is samprasāraṇa in place of [the verbal root] hvā"

Given the selection of the placement statement (64.92),

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the significations of the heading statements 3.1.1-4 and 3.1.91-3, as expressed in (65.93) below,[1] operate with 3.3.72 in the formation and application (execution) of the rule.

(65.93) 1.1.67 the fifth case-ending signifies "after"

H3.1.1	(pratyaya$_1$) "affix"
H3.1.2	"and follows"
H3.1.3	"and has high pitch on first syllable"
H3.1.4	"[but] sUP or that which has P as it is low-pitched"
H3.1.91	(dhātu$_5$) "after a verbal root"
H3.1.92	"here, that which is referred to by the term in the seventh case is upapada"
H3.1.93	"primary affix (kṛt) is that which is not a tiÑ"
3.3.72	(hvā$_6$ saṃprasāraṇa$_1$ ca nyabhyupavi$_7$ aP$_1$) "when [preverbs] ni, abhi, upa or vi - aP and there is saṃprasāraṇa in place of [the verbal root] hvā"

Because both the definiendum aP in 3.3.72 and the term pratyaya "affix" in H3.1.1 are inflected with the first (nominative) case-ending, aP is a member of the affix set of elements. Because the affix aP has P as an it the affix is assigned low pitch by H3.1.4. H3.1.91 specifies the condition after a verbal root, which is satisfied. Although nyabhyupaviṣu in 3.3.72 is inflected with the seventh (locative) case-ending,

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[1]The inclusion of (6.41) 1.1.67 is for the interpretation of the fifth case-ending of H3.1.91 dhātu$_5$. This interpretation is included in the gloss of H3.1.91.

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the preverb ni is not a concept by which some other string can be referred to and thus is not upapada by H3.1.92. Since aP is not a tiÑ, it belongs to the primary affix set according to H3.1.93. Thus, given the input (66.94), the output produced by this information is expressed in (67.94), where ` represents low pitch specified by H3.1.4.

(66.94) ni [verbal root: hvā]

(67.94) ni [verbal root: hvā] [affix, primary affix: àP]

However, (67.94) is not the complete output, for (64.92) also specifies samprasāraṇa. Although the term samprasāraṇa is inflected with the first (nominative) case-ending as is aP, it is traditionally interpreted not to be an affix but a name, the signification of which is specified by (24.49) 1.1.45 as the replacement "i, u, ṛ, ḷ in the place of y, v, r, l." Thus, similar to the interpretation of the fifth (ablative) case-ending of dhātoḥ of H3.1.91 as "after" by (6.41), the signification of the term samprasāraṇa in (64.92) is specified by (24.49) "i, u, ṛ, ḷ in the place of y, v, r, l is samprasāraṇa" as the replacement of y, v, r or l by i, u, ṛ or ḷ. The selection of the substituens from i, u, ṛ or ḷ for a given substituendum, y, v, r or l, is provided by (37.54) 1.1.50 "in the

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place - the most similar."[1] Thus, the statements in (65.93) should be supplemented by 1.1.45 and 1.1.50 as in (69.95), which may now be considered the statements necessary in the construction of the rule. Thus, given the input (66.94), the additional operation inherent in the signification of the term saṃprasāraṇa would produce the output (68.95) rather than (67.94).

		verbal root	affix, primary affix
(68.95)	ni	huā	àP

(69.95)

1.1.45	"i, u, ṛ, ḷ in the place of y, v, r, l is saṃprasāraṇa"
1.1.50	"in the place - the most similar"
1.1.67	the fifth case-ending signifies "after"
H3.1.1	(pratyaya$_1$) "affix"
H3.1.2	"and follows"
H3.1.3	"and has high pitch on first syllable"
H3.1.4	"[but] sUP or that which has P as it is low-pitched"
H3.1.91	(dhātu$_5$) "after a verbal root"
H3.1.92	"here, that which is referred to by the term in the seventh case is upapada"
H3.1.93	"primary affix is that which is not a tiN"
3.3.72	(hvā$_6$ saṃprasāraṇa$_1$ ca nyabhyupavi$_7$ aP$_1$) "when [preverbs] ni, abhi, upa or vi - aP and there is saṃprasāraṇa in place of [the verbal root] hvā"

In the construction of the rule which is composed

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[1] Cf. supra, pp. 54-57 for the discussion on the preference of (37.54) over (7.43) as the statement interpreting the application of (24.49).

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of the statements in (69.95) and which operates on (66.94) to output (68.95) there are the following steps: (1) the replacement statement receives the signification of the heading statements and (2) the elements, such as case-endings and terms (i.e., hvā, nyabhyupavi, aP and, especially, saṃprasāraṇa), in the replacement statement 3.3.72 are interpreted.

Other kinds of terms than the name of a replacement specification, e.g. saṃprasāraṇa, may be a part of the selected specification. For example, in statement (14.46) "that of which the first of the vowels is vṛddhi is vṛddham," which is a specification assigning a name to a data string, the term vṛddhi is the name of a set of elements specified by (10.44) as ā, ai, au. Thus, after the interpretation of the term vṛddhi in (14.46), the full signification of (14.46) is "that of which the first of the vowels is either ā, ai or au is vṛddham."[1]

Placement statements may also contain a term the existence of which is determined by another statement. For example, in statement 3.2.1 "when object (karman) - aṆ" the existence of the term object is specified by one of a number of statements in the kāraka set 1.4.23-55. Thus, if the activity of making

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[1]Thieme 1935:111 points out that every ā in the grammar is not considered vṛddhi but that vṛddhi is a technical term that, "when used in the grammar, denotes . . . ā, ai and au," as, e.g. in (14.46).

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a pot (kumbha) is being expressed, the statements in (70.97) are the components of the rule which may be applied to the input string (71.98), consisting of the verbal root kṛ "do, make." The output of this rule is expressed in (72.98). The string kumbha am in (72.98) satisfies 3.2.1 karman$_7$ aṆ$_1$ with H3.1.92 "that which is referred to by the term in the seventh case [i.e., karman (object) in 3.2.1] is upapada" in (70.97);[1] for the string kumbha am (or a previous stage in the generation of the string kumbha am) was produced by a rule including a specification that the existence of the karman (object) is to be expressed by the string kumbha am.[2] It should be noted that no positional order between the strings kumbha am and kṛ áṆ is specified. Thus (72.98) may be written either in the order kṛ áṆ kumbha am or kumbha am kṛ áṆ.[3]

(70:97)

H1.4.23	"when there is that which is doing"
1.4.49	"that which is most wished to be obtained by the agent is object (karman)"
1.4.54	"the independent one is agent (kartṛ)"

H3.1.1	(pratyaya$_1$) "affix"
H3.1.2	"and follows"
H3.1.3	"and has high pitch on first syllable"

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[1] Cf. the discussion concerning (59.83) and (60.83) on page 83.

[2] This is signified in (72.98) by the notation [object] under kumbha am.

[3] Positional order will be imposed by a rule forming the compound kumbhakāra- "pot-maker."

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H3.1.4 "[but] sUP or that which has P as it is low-pitched"

H3.1.91 "after a verbal root"
H3.1.92 "here, that which is referred to by the term in the seventh case is upapada"
H3.1.93 "primary affix (kṛt) is that which is not a tiN̄"
3.2.1 (karman$_7$ aṆ$_1$) "when object (karman) aṆ"

(71.98) INPUT:

verbal root
kṛ

(72.98) OUTPUT:

verbal root	affix, primary affix	
kṛ	áṆ	kumbha am [object singularity]

Given the activity of making a pot, the kāraka set 1.4.23-55 specifies the existence of the terms object and agent; that is, the set of statements 1.4.23-55 yields the term object if there is the condition "that which is most wished to be obtained by the agent" (i.e., the pot) and the term agent if there is the condition "the independent one," which may or, as in our selected example, may not be named (i.e., cited by a lexical item). These terms, representing the perceptual factors (arguments) in the activity (function) of making a pot, are spatially and temporally unordered.

In contrast to the term karman$_7$ in 3.2.1 being

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under the domain of H3.1.92 in (70.97) the term karman$_7$ in statement 2.3.2 in (73.99) below is not under the domain of H3.1.92 "that which is referred to by the term in the seventh case is upapada." Because of H3.1.92, the affix selected according to 3.2.1 in (70.97) does not express but, instead, indicates that there is a referent which is identified on the basis that it is "that which is most wished to be obtained by the agent." The string having the accusative case-ending selected by 2.3.2 of (73.99) expresses that referent. Note that the output (75.100) is the referent of the string kṛ áṆ in (72.98).

(73.99)

1.4.21 1.4.22	"when duality or singularity - the dual or the singular (respectively)"
H1.4.23	"when there is that which is doing"
1.4.49	"that which is most wished to be obtained by the agent is object (karman)"
1.4.54	"the independent one is agent (kartṛ)"
1.4.55	
1.4.103	"those elements of each triplet of sUP [elements listed at 4.1.2] are, one by one - singular, dual, plural"
H2.3.1	"when not placed"
2.3.2	"when object (karman$_7$) - the second (accusative) [triplet]"
2.3.73	
H3.1.1	(pratyaya$_1$) "affix"
H3.1.2	"and follows"
H3.1.3	"and has high pitch on first syllable"
H3.1.4	"[but] sUP or that which has P as it is low-pitched"

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H4.1.1 "after Ṅi, āP or nominal stem (prātipadika)"
4.1.2 "sU au Jas am auṬ Śas Ṭā bhyām bhis Ṅe bhyām bhyas ṄasI bhyām bhyas Ṅas os ām Ṅi os suP"
5.4.160

(74.100) nominal stem: kumbha

(75.100) nominal stem: kumbha; affix, sUP: àm [object singularity]

In (75.100), statement (9.43) 4.1.2, which by itself is an ordered list of elements, together with the signification "after Ṅi, āP or nominal stem" of the heading statement 4.1.1 is a placement statement, for it specifies potential substituenda and a position of placement. The selection of the particular element to be placed after the nominal stem is determined by two arguments, case-ending and number. Because there is the condition "that which is most wished to be obtained by the agent" (i.e., the pot is perceived in the activity of making a pot), the kāraka set yields the term object. Because that particular object has not been a condition in the definiens specifying the existence of a particular case-ending term,[1] H2.3.1 "when not placed" in

[1] Cf. (72.98) in which the string kṛ áN does not have the signification [object].

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(73.99) is satisfied and 2.3.2 "when object" specifies the condition for the existence of the term second (accusative), which, by convention, refers to the second triplet of elements listed at 4.1.2, am auṬ Śas. Statement 1.4.22 in the set 1.4.21-22[1] specifies, under the condition that there is singularity, the existence of the term singular, the name for the set of elements specified by 1.4.103 as the first element of each triplet at 4.1.2. Thus, the element am is selected. This element is, according to H3.1.1, a member of the affix set and, because it is a sUP, has low pitch by H3.1.4.[2]

In (73.99) the construction of the rule includes three sets of statements containing contrasting definientia and outputting terms: the number set 1.4.21-22, the kāraka set 1.4.23-55 and the case-ending set 2.3.1-73. This is demonstrated in (76.101) - (77.102) below.

(76.101) 1.4.21-22: singular
[singularity]

1.4.103: singular: {sU, am, Ṭā, Ne, NasI, Nas, Ni}

---

[1]Statement 1.4.21 specifies the plural when there is plurality.

[2]In this study only pitch resulting from a rule containing H3.1.3-4 will be marked. This, however, does not imply that that pitch is on that affix in the final surface form, for there are accent statements which this study will not cover.

Because this is a study of the context of the kārakas, later in this study pitch resulting from a rule containing H3.1.3-4 will not always be marked in strings.

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dual: {au, auṬ, bhyām, bhyām, bhyām, os, os}

plural: {Jas, Śas, bhis, bhyas, bhyas, ām, suP}

The output of the number set 1.4.21-22 is a term (e.g., singular) which is specified under a given condition (singularity, which contrasts with other conditions) and which is the name (singular) for one of the sets of elements specified by 1.4.103.

(77.102) 1.4.23-55: object (karman)
[that which is most wished to be obtained by the agent]
agent (kartṛ)
[the independent one]

2.3.1-73: second
[object]

By convention:

first: {sU, au, Jas}
second: {am, auṬ, Śas}
third: {Ṭā, bhyām, bhis}
fourth: {Ṅe, bhyām, bhyas}
fifth: {ṄasI, bhyām, bhyas}
sixth: {Ṅas, os, ām}
seventh: {Ṅi, os, suP}

The output of the kāraka set 1.4.23-55 are two terms, object and agent. However, in the given activity of making a pot, the nominal stem kumbha - "pot" (defined by (15.46) 1.2.45 as that which has signification) is perceived as that which is most wished to be obtained by the agent and therefore is object by 1.4.49 as opposed to agent by 1.4.54 and to any other kāraka term. The

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existence of the term object, which is merely a symbol of the grammar signifying in this instance that which is most wished to be obtained by the agent, is one of the features (arguments) in the set of contrasting definientia in the set 2.3.1-73, which, in turn, yields a term (second) under a given condition (the existence of the term object).[1] By convention, the term second is the name of a set of elements which are the second triplet[2] of elements listed at 4.1.2.

(78.103) Intersection of sets: am
singular: {sU, am, Ṭā, Ne, NasI, Nas, Ni}
second: {am, auṬ, śas}

The intersection of these two sets, the singular set and the second set, completes the selection of the affix am.[3] It should be noted at this point that placing the symbol [object] in (75.100) is merely a notational device to represent one of the non-contextual conditions in the combination of statements (73.99), the condition "that which is most wished to be obtained by the agent," one of the contrasting definientia in the kāraka set

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[1] Note that other features may be present in the condition. Cf. 2.3.55, which has not only the feature object of the particular verbal root nāth but also the feature benediction.

[2] This may be implied from 1.4.104 vibhaktiśca.

[3] One might consider that the intersection of the singular set and the second set is specified by (37.54) 1.1.50 "in the place - the most similar," where the most similar of the members of the two sets is, by identity, am.

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1.4.23-55.

A rule similar to (73.99) is (79.104) below with input (80.105) and output (81.105). In this rule as in (70.97) and (73.99), the activity under consideration by the kāraka set 1.4.23-55 is the making of a pot. This rule selects a conjugational ending from the elements listed at (8.43) 3.4.78. The input (80.105) is a string which was the output of a previous rule which placed LAṬ with the signification of the present tense.[1]

(79.104)
- 1.3.12, 1.3.78, 1.3.93 "after the remainder, when agent - the parasmaipada"
- 1.4.21, 1.4.22 "when duality or singularity - the dual or the singular"
- H1.4.23 "when there is that which is doing"
- 1.4.49 "that which is most wished to be obtained by the agent is object (karman)"
- 1.4.54, 1.4.55 "the independent one is agent (kartṛ)"
- 1.4.99, 1.4.100 "in the place of L is parasmaipada"
- 1.4.101 "the three triplets of tiN̄ [elements listed at 3.4.78] are third person, second person, first person (respectively)"
- 1.4.102 "those elements of each triplet of tiN̄ [elements listed at 3.4.78] are, one by one - singular, dual, plural"

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[1] A translation of the Sanskrit more accurate than "present tense" is "occurring, turning."

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1.4.105
1.4.108 "in the remainder [i.e., other than those conditions specified by 105-107] - third person"

H3.1.1 (pratyaya$_1$) "affix"
H3.1.2 "and follows"
H3.1.3 "and has high pitch on first syllable"
H3.1.4 "[but] sUP or that which has P as it is low-pitched"

H3.1.91 (dhatu$_5$) "after a verbal root"
H3.1.92 "here, that which is referred to by the term in the seventh case is upapada"

H3.1.93 "primary affix (kṛt) is that which is not a tiN̄"
3.4.77 "in the place of L"
3.4.78 "tiP tas JHi
siP thas tha
miP vas mas
ta ātām JHa
thās āthām dhvam
iṬ vahi mahiN̄

(80.105) INPUT:

verbal root	affix
kṛ	LAṬ [present]

(81.105) OUTPUT:

verbal root	affix, tiN̄
kṛ	tìP Ṭ

In (79.104) the construction of the rule includes four sets of statements containing contrasting definientia and yielding terms: the ātmanepada-parasmaipada set 1.3.12-93, the number set 1.4.21-22, the kāraka set 1.4.23-55 and the person set 1.4.105-108. The outputs

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of these sets are demonstrated in (82.106) - (84.107) below.

(82.106) 1.4.23-55: object
agent

1.3.12-93: parasmaipada

1.4.99-100: parasmaipada: {tiP, tas, JHi, siP, thas, tha, miP, vas, mas}

ātmanepada: {ta, ātām, JHa, thās, āthām, dhvam iṬ, vahi, mahiÑ, āna}

The output of the kāraka set 1.4.23-55 are two terms, object and agent. The existence of these two terms are conditions in the contrasting set of definientia in the ātmanepada-parasmaipada set 1.3.12-93. In the simple activity of making a pot either 1.3.13 having the definiens "when bhāva or object" or 1.3.78 "after the remainder [i.e., other than those specified by 1.3.14-77], when agent" are satisfied to respectively output the term ātmanepada or the term parasmaipada. If the agent is selected the output is the term parasmaipada.

The traditional interpretation (Miśra:80) of 1.4.99 is that the substitutes of L are called parasmaipada. Considering that 1.4.99-100 form a small subset and that 1.4.100 cites specific elements (the last nine elements listed at 3.4.78 and āna), the term parasmaipada stands for the set of all potential substituentia which are not those specified by 1.4.100 as ātmanepada. Thus, the

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parasmaipada set of elements in the rule (79.104) is composed of those members of tiÑ (listed at 3.1.78) which do not belong to the ātmanepada set.

(83.107) 1.4.21-22: singular

1.4.102: singular: {tiP, siP, miP, ta, thās, iṬ}
dual: {tas, thas, vas, ātām, āthām, vahi}
plural: {JHi, tha, mas, JHa, dhvam, mahiÑ}

The output of the number one 1.4.21-22 is the term singular, which is specified if there is singularity and which is the name for one of the sets of elements specified by 1.4.102.

(84.107) 1.4.105-108: third person

1.4.101: third person: {tiP, tas, JHi, ta ātām, JHa}
second person: {siP, thas, tha, thās, āthām, dhvam}
first person: {miP, vas, mas, iṬ, vahi, mahiÑ}

The output of the person set 1.4.105-108 is the term prathama, which translates literally as "first" but is what Western grammarians call third person. This term is the name for one of the sets specified by 1.4.101.

(85.107) Intersection of sets: tiP

parasmaipada: {tiP, tas, . . . mas}
singular: {tiP, siP, . . . iṬ}
third person: {tiP, tas, . . . JHa}

The intersection of these three sets completes

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the selection of the affix tìP. Because this affix has P as an it, it has low pitch by H3.1.4.

The justification of the notational representation of the output of (79.104) on the input (80.105) has certain consequences. The input (80.105) has the sign [present] beneath LAṬ. According to (38.57) "except in an operation on a sound, the substituens is like the substituendum," the substituens tìP should also have the sign [present] attached to it. Given that a previous rule having the condition "when occurring [present tense]" outputted (80.105), then that condition [present] might be attached to LAṬ. However, consider the following consequences of consistently following such a notational procedure.

In (79.104) the term agent is yielded by the kāraka set 1.4.23-55 on the condition "the independent one." This condition may be considered the signification of the term agent, which is one of the conditions in the determination of the term parasmaipada by the 1.3.12-93 set. Similar to writing [object] in (75.100), [agent] might be placed beneath tìP in (81.105), as below.

(86.108)

verbal root	affix, tiÑ
kṛ	tìP Ṭ
	[present agent]

Consistently, we should place the condition for the determination of the term third person by the

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1.4.105-108 set also below tìP in (86.108). However, the definiens of 1.4.108, "in the remainder," is an elsewhere statement. Placing [elsewhere] below tìP in (86.108) would be vacuous, for the signification of 1.4.108 is when none of the conditions in 1.4.105-107 hold. Thus, the condition is the contrast between the presence of any and the absence of all the conditions specified in 1.4.105-107. Alternatively, we could place beneath tìP in (86.108) the definientia of 1.4.105-107 with minus signs before them.

Another alternative would be not to place anything representing the condition for the determination of the term (set of elements called) third person. The signification of the third person set of conjugational endings would be expressed in the contrast stated in the 1.4.105-108 set of statements as a part of the rule. The signification of an element being stated in the rule which outputs (yields) that element retains the contrast in conditions, which, in the case of 1.4.105-108, is the signification assigned to the third person set of conjugational endings. This alternative, which seems preferable, results, in contrast to only the string, in both the rule and the input and output strings remaining in the derivational history of a string.[1] In this paper,

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[1]Another consideration is that a syntactic condition may be one of the conditions for the selection of a set of elements. For example, in 1.3.17 "after

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for the sake of convenience of reference, we write a signification s which is pertinent for the discussion as [s] under the element it is associated with, rather than repeat the rule itself, the rule number or statement number previously applied in the generation.

A summary of the structure of a rule in this grammar is a non-heading statement with all pertinent information needed to interpret that statement. It appears that the interpretation of that non-heading statement or origin[1] proceeds in the following manner.

(1) The genitive (sixth), locative (seventh) and ablative (fifth) case-endings of the terms in the origin are interpreted in light of statements (4.40) - (6.41), which specify notation. In addition to the locative (seventh) case-ending specifying the position before an element x, the locative (seventh) case-ending may also by convention specify the existence of some-

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ni viś - the ātmanepada" besides the existence of the element ni followed by viś there is the condition that the position under consideration is the one after ni viś.

A consequence of the interpretation that the derivational history includes not only the string but the rule is that there must be a convention whereby the derivational history of the element luk, ślu or lup could not be referred to. Cf. supra, pp. 62-63.

[1]The non-heading statement under consideration will henceforth be referred to as the origin of the rule. Thus, in (63.92) and (79.104) the origins are respectively 3.1.133 and 3.4.78.

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thing (translated as "when").[1]

(2) The origin receives the signification of the heading statements of all sets of statements of which it is a member. It is not necessary during the interpretation of the origin that all conditions specified in the heading statements exist in the origin. For example, it is not necessary that, according to H3.1.92, the term inflected in the locative (seventh) case in the origin must be that by which an entity is recognized.[2]

(3) After the interpretation of the case-endings of the terms in the origin, the terms themselves are interpreted. The signification of a term may be specified by another statement (e.g., saṃprasāraṇa), by a series of statements (e.g., at, tiñ) or by interrelated statements (e.g., object in 3.2.1 of (70.97)). This information is part of the rule.

If the term in the nominative (first) case in the origin is an element, a list of elements or the name of a set of elements; then it is the substituens, the list of possible substituentia or the name of the set of possible substituentia,[3] respectively. If there

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[1]This may result in some indeterminacies in the rigorous interpretation of the grammar.

[2]Cf. the discussion of the term nyabhyupavi in 3.3.72 of (65.93) on pages 93-94.

[3]However, if the name of a set of elements is

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are potential substituentia and the other conditions in the origin are satisfied, the selection of one of these elements may be determined by a set of statements or by a series of statements operating together, such as described above in the selection of a tiN̄ or sUP; otherwise the selection is nonconditioned (optional). This completes a brief summary of the most important characteristics of rules.

Traffic Rules

The most tenuous formal characteristics of the grammar are the conventions ordering the applications of rules. Along with the anuvṛtti problem this is the most crucial area in need of rigorous statement, justification and testing; for without these conventions the grammar is unintelligible. The purpose of the following discussion is to propose some tentative conventions and to indicate some specific problems.[1]

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a term in the origin but is defined by a statement heading a set of statements in a set of which the origin is a member, then it is not the name of a set of potential substituentia. For example, although the term kṛt (primary affix) is a term inflected in the nominative case in 3.4.67, it is not the name of a set of potential substituentia because it is defined by H3.1.93, which is a heading statement of the set of statements 3.1.91-3.4.117. This will be returned to in the discussion of traffic rules.

[1]A more formal approach to rule construction may alter the conventions set forth in this section. Also, because the topic of this study is the kārakas, the focus is on the justification of the treatment of

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There is a correlation between certain rules which assign a name to a string and the first heading statement of a large set of statements. For example, given the form kumbha, which has the signification "pot," (15.46) 1.2.45 "that which has signification, not a verbal root, not an affix (pratyaya), is a nominal stem (prātipadika)" assigns the name nominal stem to the form kumbha as in the following.

(87.113) nominal stem
kumbha

The origin of the next rule is to be selected from the large set of statements containing the term nominal stem in its first heading statement, i.e., H4.1.1 "after Ni, aP or nominal stem." Thus, 4.1.2 may be chosen from the set 4.1.1-5.4.160 as the origin of the next rule as in (73.99).[1]

Because the primitive element kṛÑ is in an ordered list of elements beginning with bhū, statement (13.46) 1.3.1 "bhū etc. are verbal roots" assigns the name verbal root (dhātu) to kṛÑ. In this paper we will call a rule which assigns a name to a string a naming rule.

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affixes by statements 3.1.1-4.1.2 and not on statements 6.1.1-8.4.68. Consequently, more accurate and complete traffic rules will result only with inclusion of these sūtras in the analysis.

[1]In this discussion the outline (62.87) of sets of statements along with pertinent naming statements may be a helpful reference.

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verbal root

(88.114) $\overbrace{kr\tilde{N}}$

Parallel to the assignment of the name nominal stem to the form kumbha causing the origin of the next rule to be applied to be selected from the set of statements having the heading statement "after $\bar{N}\bar{i}$, $\bar{a}P$ or nominal stem," the origin of the next rule to be applied to the string (88.114) will be selected from the set of statements having the heading statement "after a verbal root." The following convention, which will be referred to as the set selection convention, expresses this traffic observation:

(C4.114) The assignment of the name N to a string (or substring) specifies that the potential origin of the next non-naming rule to be applied is contained within the set of statements having N as a term in its first heading statement.

Thus, the origin of the next non-naming rule to be applied is contained within the set 3.1.91-3.4.117. Alternatively, we may say that control is now passed to that set; i.e., that the potential successive selection of origins is limited to that set. The selection of the particular origin is determined by (1) the structure of the subsets of the set in control (e.g., 3.1.91-3.4.117) and (2) the conditions specified in the definientia of the statements. Let us consider the selection of state-

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ment 3.1.133 as the origin of the next rule, the component statements of which are expressed in (63.92). The following is the output of that rule.

	verbal root	affix, primary affix
(89.115)	kr̥Ñ	NvuL

The origin of the next rule to be applied is searched for sequentially beyond the last origin, 3.1.133. This origin is 3.4.67. The following expresses the components of this rule.

(90.115)

H1.4.23	"when there is that which is doing"
1.4.54	"the independent one is agent (kartr̥)"
H3.1.1	(pratyaya$_1$) "affix"
H3.1.2	"and follows"
H3.1.91	"after a verbal root"
H3.1.92	"here, that which is referred to by the term in the seventh case is upapada"
3.4.67	(kartr̥$_7$ kr̥t$_1$) "when agent (kartr̥) - primary affix (kr̥t)"

It should be noticed that the above includes neither H3.1.3-4 "and has high-pitch on first syllable, but sUP or that which has P as it is low-pitched" nor H3.1.93 "a primary affix (kr̥t) is that which is not a tiÑ" for this information has already been used in the application of (63.92).[1] The origin 3.4.67 may be literally translated as "when agent (kartr̥) - primary affix

[1] H3.1.1-2 and H3.1.91 are included in (90.115) to indicate the element being focused on. This information might, however, be considered redundant.

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(kṛt)." However, because the term kartṛ is inflected in the seventh (locative) case in 3.4.67, it is, according to H3.1.92, the term signifying that by which a referent is recognized. Also, as was noted above,[1] although the term kṛt (primary affix) is inflected in the first (nominative) case in 3.4.67, it is not the name of a set of potential substituentia because the term kṛt is defined by H3.1.93 which is a heading statement of the set of statements 3.1.91-3.4.117 of which 3.4.67 is a member. Thus, a better translation of the origin 3.4.67 together with H3.1.92 is "if there is a member of the primary affix (kṛt) set, then it indicates that there is a referent which is the agent." This may be taken as evidence that Pāṇini considered that every verbal root denoted an agent. The output of the rule expressed in (90.115) is the following.

	verbal root	affix, primary affix
(91.116)	kṛÑ	ṆvuL (agent)

Again, the origin of the next rule to be applied is searched for sequentially beyond the last origin, 3.4.67. Statement 3.4.113 "a tiÑ (elements listed at 3.4.78) or that which has ś as it is a sārvadhātuka" does not apply because ṆvuL neither is one of the affixes listed at 3.4.78 nor has ś as an it. However, 3.4.114

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[1] Cf. supra, footnote 3, p. 111.

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"the remainder are ārdhadhātuka" assigns the name ārdhadhātuka to the string ṆvuL. The components of this rule and the output are respectively given in (92.117) and (93.117) below. That ṆvuL rather than kṛ̃Ṇ is being referred to by 3.4.113 is indicated by the fact that both the term affix (pratyaya) of H3.1.1 and the term ārdhadhātuka of 3.4.114 are inflected with the first (nominative) case-ending.

(92.117)

H3.1.1 (pratyaya$_1$) "affix"
H3.1.2 "and follows"
  H3.1.91 "after a verbal root"
    3.4.113 "a tiṄ (elements listed at 3.4.78) or that which has ś as it is sārvadhātuka"
    3.4.114 (ārdhadhātuka$_1$ śeṣa$_1$) "the remainder are ārdhadhātuka"

(93.117)

verbal root	ārdhadhātuka, affix, primary affix
kṛ̃Ṇ	ṆvuL (agent)

Statement 3.4.114 is the last origin to be selected in the set in control, 3.1.91-3.4.117. On the basis of the order of the selection of the origins of the above three rules, i.e., 3.1.133, 3.4.67 and then 3.4.114, the following convention, which will be referred to as the iteration convention, may be adopted.

(C5.117) If in the set 3.1.91-3.4.117 there is more than one rule origin, the statement number

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of each successive origin is greater than the statement number of the previous origin.

The output of the last rule having its origin in the set 3.1.91-3.4.117 is examined by rules the origins of which have lower statement numbers (are higher in the grammar) than 3.1.91. Let us consider naming statement (17.46) 1.4.13 "beginning with that (tad), after which there is an affix-operation (pratyayavidhi), before an affix (pratyaya) is a base (aṅga)," which assigns the name base to the verbal root kṛÑ. Because the verbal root kṛÑ has been focused on, we may consider it the variable referred to as that (tad)[1] in the phrase beginning with that in 1.4.13.

The structure (93.117), composed of a verbal root kṛÑ,[2] after which there is an affix-operation[3]

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[1]Cf. supra (C1.42) for the discussion of the variable tad.

[2]Because the its do not appear according to 1.3.9 "there is lopa of that [an it]" together with 1.1.60 "lopa is non-appearance," the its may be dropped from the string. Thieme 1935:1 implies that an it is dropped after it operates in a rule. If this convention is adopted the Ñ of the verbal root kṛÑ should probably be dropped after operations on the verbal root are completed, for it indicates characteristics of the verbal root. These characteristics, for example pitch, will not be accounted for in this study and thus the Ñ is unjustifiably dropped in (95.119).

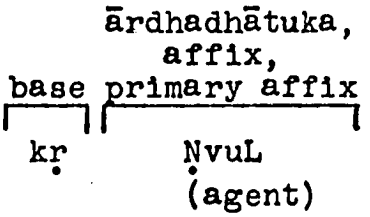
[3]The fact that control has passed from the verbal root set 3.1.91-3.4.117 may indicate that all operations concerning the selected affix ṆvuL have

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and which is before the affix ṆvuL, satisfies naming rule (17.46), given again as (94.119) below. The output is expressed in (95.119).

(94.119) 1.4.13 "beginning with that (tad), after which there is an affix-operation (pratyayavidhi), before an affix (pratyaya) is a base (aṅga)"

(95.119)



According to the set selection convention (C4.114), the assignment of the name base (aṅga) to the substring kṛ specifies that the origin of the next non-naming rule to be applied is contained within the set of statements having the name base as a term in its first heading statement. Thus, control is passed to the base set 6.4.1-7.4.97 with heading statement "of a base."

Given the input (95.119), the following is the sequence of rule applications with origins in the base set 6.4.1-7.4.97. The output of each rule follows the respective components of each rule.

(96.119) 1.1.56 "except in an operation on a sound, the substituens is like the substituendum"

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been completed. This might be taken as evidence for interpreting pratyayavidhi in 1.4.13 as "operation(s) on an affix." Cf. the discussion of (17.46) 1.4.13, supra, p. 49.

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1.3.10 "according to the enumerating is the assignment of equivalents"

H6.4.1 "of a base (aṅga)"
7.1.1 "in the place yu or vu - an or aka"

ārdhadhātuka,
affix,
base primary affix

(97.120) kṛ ṆakaL
(agent)

In (96.119), statement (38.57) 1.1.56 "except in an operation on a sound, the substituens is like the substituendum" specifies a characteristic of the replacement statement 7.1.1. It specifies that the substituens aka has the characteristics ārdhadhātuka, affix, primary affix and (agent) of the substituendum vu.

(98.120) 1.1.1 "vṛddhi is ā, ai, au"

1.1.50 "in the place - the most similar"

1.1.51 "ă, ĭ or ŭ in the place of ṛ is followed by r"[1]

H6.4.1 "of a base"
7.2.115 "in the place of a, i, u, ṛ, ḷ, ai or au, before that which has Ñ or Ṇ as it - vṛddhi"

ārdhadhātuka,
affix,
base primary affix

(99.120) kār aka
(agent)

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[1] By convention, statement 1.1.51 is taken to apply whenever the replacement of ṛ by ă, ĭ, or ŭ occurs.

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Although the Ṇ of ṆakaL in the input (97.120) is one of the arguments in the rule (98.120), the L of ṆakaL probably indicates pitch (cf. 6.1.193). Since this study is not concerned with phonology, such its along with certain others will be dropped without justification.

There are no more rule origins within the base set 6.4.1-7.4.97. As in the verbal root set 3.1.91-3.4.117, there was more than one rule origin, in this instance two of them, and the statement number of each successive origin (7.2.115) is greater than that of the previous origin (7.1.1).

It may be assumed that at this point in the generation the string (99.120) undergoes no more rules having origins in statements 6.1.1-8.4.68. It appears that the output (99.120) is examined by naming rules higher in the grammar. Statement (16.46) 1.2.46 "that which has signification, having a primary affix, secondary affix or compound is a nominal stem" assigns the name nominal stem to the entire string on the basis that aka is a primary affix (a characteristic of vu attributed to aka by 1.1.56 in (96.119) (cf. the non-it portion of ṆvuL of (95.119)). The new string is given in (100.121) below. We note that the derivational history of this nominal stem provides its fundamental signification.

(100.121) nominal stem
┌ kāraka ┐

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As with (88.114) and (95.119), the origin of the next rule to be applied to the named string is indicated by the set selection convention (C4.114) "the assignment of the name N to a string (or substring) specifies that the potential origin of the next non-naming rule to be applied is contained within the set of statements having N as a term in its first heading statement." Thus, control is passed to the 4.1.1-5.4.160 set, where, let us say, 4.1.2 is selected as the next origin.[1]

Let us assume that the dative (fourth) singular affix Ne is selected by the rule having its origin at 4.1.2 in a manner similar to the selection of the accusative singular affix am for the nominal stem kumbha "pot" of (75.100). The output (101.122) is expressed below without attaching any condition (signification) under the affix Ne.

(101.122) nominal stem kāraka; affix, sUP Ne

Naming rule 1.4.13 "beginning with that (tad), after which there is an affix-operation, before an affix is a base" applies to the string (101.122). The result is the following.

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[1]Note that the selection of 4.1.2 is determined not only by the existence of the nominal stem under consideration but also by the structure of the 4.1.1-5.4.160 set, which is not accounted for in this study.

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	base	affix, sUP
(102.123)	kāraka	Ñe

Set selection convention (C4.114) now passes control to the base set 6.4.1-7.4.97 headed by the statement "of a base (aṅga)." The following is the sequence of rule applications with origins in this set. As usual, the output of each rule follows the respective components of each rule.

(103.123) 1.1.56 "except in an operation on a sound, the substituens is like the substituendum"

H6.4.1 "of a base"
7.1.13 "after a, in the place of Ñe - ya"

	base	affix, sUP
(104.123)	kāraka	ya

(105.123) H6.4.1 "of a base"
7.3.102 "in the place a - the long, before y, v, r, l, ñ, m, ṅ, ṇ, n, jh or bh of a sUP"

	base	affix, sUP
(106.123)	kārakā	ya

In (103.123) statement (38.57) 1.1.56 "except in an operation on a sound, the substituens is like the substituendum" specifies a characteristic of the replacement statement 7.1.13. It specifies that the substituens ya has the characteristics affix and sUP, the names of the sets of elements of which the substituendum Ñe is a member. This assigns the ya to

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the sUP set or, alternatively, states that ya has the characteristic sUP so that the condition of a sUP of 7.3.102 of (105.123) will be satisfied. After application of (105.123), naming statement 1.4.14 "that which has a final sUP or tiN is a word (pada)" applies to (106.123), control is passed to the set of statements headed by 8.1.16 "of a word (pada)" and phonological rules relating to the boundary of the word are applied.

The following is a summary of the above generation.

(107.124)

(a) Selection of verbal root kr̃Ñ.

(b) By the set selection convention (C4.114) control is passed to the set of statements 3.1.91-3.4.117, headed by H3.1.91 "after a verbal root"

(c) By the iteration convention (C5.117) rules having origins in the set 3.1.91-3.4.117 operate. The last rule having its origin in this set yields:

(93.117)

verbal root	ārdhadhātuka, affix, primary affix
kr̃Ñ	ṆvuL (agent)

(d) The naming rule 1.4.13 assigns the name base (aṅga):

(95.119)

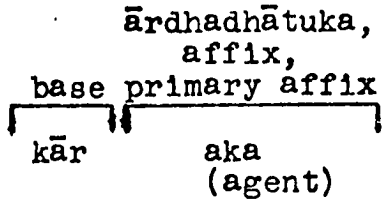
base	ārdhadhātuka, affix, primary affix
kṛ	ṆvuL (agent)

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(e) By the set selection convention (C4.114) control is passed to the set of statements 6.4.1-7.4.97, headed by H6.4.1 "of a base (aṅga)"

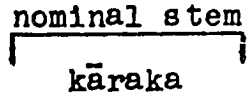
(f) By the iteration convention (C5.117) rules having origins in the set 6.4.1-7.4.97 operate. The last rule having its origin in this set yields:

(99.120)



(g) Rule 1.2.46 assigns the name nominal stem (prātipadika) on the basis of the presence of the primary affix (kṛt) aka.

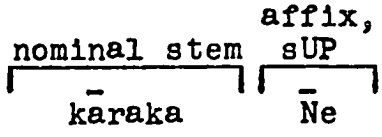
(100.121)



(h) Control is passed to the set of statements 4.1.1-5.4.160, headed by H4.1.1 "after ṄI, āP or nominal stem"

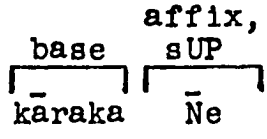
(i) Selection of sUP by rule having its origin at 4.1.2:

(101.122)



(j) Naming rule 1.4.13 assigns the name base (aṅga):

(102.123)

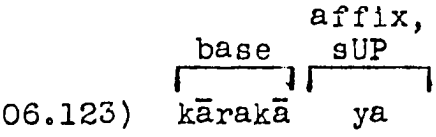


(k) Control is passed to the set of statements 6.4.1-7.4.97, headed by H6.4.1 "of a base (aṅga)"

(l) By the iteration convention (C5.117) rules

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having origins in the set 6.4.1-7.4.97 operate. The last rule of this set outputs:



(m) Rule 1.4.14 assigns the name word (pada) and control is passed to the set of statements headed by 8.1.16 "of a word (pada)"

Although this is the general pattern of such generations as they are found in the literature,[1] it is not intended to exemplify a lucid description of rules having origins in statements 6.1.1-8.4.68. Whereas the set selection convention (C4.114) "the assignment of the name N to a string (or substring) specifies that the potential origin of the next non-naming rule to be

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[1]It should be noted that the traffic in the generation of kārakāya given above could proceed in the following different order, while the form kārakāya would still result. Instead of the selection of naming rule 1.4.13 in (107.124) (d), naming rule 1.2.46 could be selected to assign the name nominal stem to (93.117). A sUP could then be selected by the rule having its origin at 4.1.2. Thus, after all affixes are placed in the string, the rules having their origins in the 6.4.1-7.4.97 set could be applied in the following order; where the statement numbers are those of the origins: 1.4.13, 7.1.1, 7.2.115, 1.4.13, 7.1.13, 7.3.102.

Misra 1966:35 indicates that affixes are first placed in the string and then the "morphophonemic" operations occur. In the literature, however, the general pattern of generations is the placement of an affix (pratyaya) followed by the application of the 6.4.1-8.4.68 operations relating to that affix. This study only points out that besides these two possibilities there is a third: namely, that either could be formally justifiable and there would be no substantive difference.

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applied is contained within the set of statements having N as a term in its first heading statement" appears to be fairly general, there are local traffic rules indigenous to statements 6.1.1-8.4.68.

For example, if the verbal root (dhātu) were ci "gather," the rule applications for the particular generation cāyakāya "gatherer," inflected with the dative case-ending, would parallel the above one thru (97.120). The origin of the next rule would also be 7.2.115, but the rule would not include 1.1.51. The output (99.120) would be the following.

	ārdhadhātuka, affix,	
	base	primary affix
(108.127)	cai	aka (agent)

In contrast to (99.120), the above string would undergo the following general phonological rule to become the output cāy aka.

(109.127) 1.3.10 "according to the enumerating is the assignment of equivalents"

6.1.78 "in place of e, o, ai or au - ay, av, āy, āv before a, i, u, ṛ, ḷ, e, o, ai, or au"

To explain the selection of such a rule, the origin of which is not a member of the set in control (6.4.1-7.4.97), would entail a full-scale study of statements 6.4.1-8.4.68.

Let us now consider another generation involving

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the primitive element kṛÑ "do, make." Given that this is a verbal root (dhātu), the potential origin of the next non-naming rule to be applied is contained within the set of statements 3.1.91-3.4.117, headed by the statement "after a verbal root." Of the alternative affixes which may be placed after kṛÑ, let us select LAṬ.[1] The origin of the rule and the output are respectively presented in (110.128) and (111.128) below. In (110.128) and hereafter, the origins of rules within the verbal root set 3.1.91-3.4.117 will be presented; whereas the heading statements 3.1.1-4 and 3.1.91-94 may or may not be presented but are implicitly understood.

(110.128) 3.2.123 "when occurring (turning; i.e., present) - LAṬ"

(111.128)

verbal root	affix
kṛÑ	LAṬ [present]

[1]Any of five other affixes (pratyayas) expressing other tenses or four expressing modes may have been selected. These are the following: LUÑ specified at 3.2.110, LAÑ specified at 3.2.111, LIṬ at 3.2.115, LṚṬ at 3.3.13, LUṬ at 3.3.15, LṚÑ at 3.3.139, LIÑ at 3.3.161, LOṬ at 3.3.162 and LEṬ at 3.4.7. Widely separated within the set 3.1.91-3.4.117, these affixes all contain the symbol L. The procedure is not first to place L and then to replace L with one of these ten affixes. Such a procedure is unnecessary in the set 3.1.91-3.4.117, where, by convention, only one original affix A may be chosen but A may be replaced by another affix with the preservation of the characteristics of A by (38.57) 1.1.56.

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According to the iteration convention (C5.117), the next potential rule origin within the set 3.1.91-3.4.117 has a statement number greater than 3.2.123. This origin is 3.4.69, given in (112.130) below. Given that the kāraka set yields the terms agent (kartṛ) and object (karman) and thus that an agent and an object exist, 3.4.69 with H3.1.92 states that the L[1] indicates that there are referents which are distinguished by the concepts "the independent one," expressed by the term agent, and "that which is most wished to be obtained by the agent," expressed by the term object. Loosely, statement 3.4.69 with H3.1.92 may be said to specify that the L of the string kṛÑ LAṬ denotes that the activity involves the combination of the verbal root, the agent and the object. As with the literal translation of 3.4.67 in (90.115), the origin 3.4.69 may be literally translated as "the Ls - when agent (kartṛ) and object (karman) or when agent and bhāva after that which does not have an object." However, because the terms kartṛ and karman are inflected in the seventh (locative) case in 3.4.69, a better translation of the rule having the origin 3.4.69 is "if there is one of the Ls, then it indicates either (1) that there are referents which are distinguished by the concepts 'the independent one' and 'that which is most wished to be

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[1]The L under consideration is the L of LAṬ, LUÑ, LAÑ, etc. Cf. supra, footnote 1, p. 128.

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obtained by the agent' or (2) that there is the referent which is distinguished by the concept "the independent one" and bhāva after that which does not have a referent distinguished by the concept expressed by the term object."

(112.130)
H1.4.23 "when there is that which is doing"
1.4.49 "that which is most wished to be obtained by the agent is object (karman)"
1.4.54 "the independent one is agent (kartṛ)"

H3.1.92 "that which is referred to by the term in the seventh case is upapada"
3.4.69 (L_1 karman$_7$ ca bhāva$_7$ ca akarmaka$_5$ kartṛ$_7$) "Ls - when agent (kartṛ) and object (karman) or when agent and bhāva after that which does not have an object"

	verbal root	affix
(113.130)	kṛÑ	LAṬ [present] (agent) (object)

The next rule origin selected is 3.4.78. This rule, the components of which are expressed in (79.104), selects an affix which may be considered a conjugational ending of what will eventually become a finite verb. The output (81.105) retains the Ṭ.

According to (38.57) 1.1.56 ". . . the substituens is like the substituendum," the characteristics of the original affix (pratyaya) are assigned to the affix replacing it. Thus, the characteristic [present]

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of (111.128) and the referential symbols (agent) and (object) of (113.130) are assigned to (81.105).

According to the iteration convention (C5.117), the next rule origin has as statement number a number greater than 3.4.78. Statement 3.4.78 is followed by statements 3.4.79-112 which specify modifications to the tiÑ selected by the rule having its origin at 3.4.78. The Ṭ in the input string (81.105) is used as a condition in some of the statements 3.4.79-112. As none of the conditions in these statements hold, we may drop the Ṭ from our string, leaving the following.

(114.131)

verbal root	affix, tiÑ
kṛÑ	ti [present agent singularity] (agent) (object)

The next rule having its origin within the set 3.1.91-3.4.117 is given below with corresponding output.

(115.131) 3.4.113 "a tiÑ or that which has ś as it is sārvadhātuka

(116.131)

verbal root	sārvadhātuka, affix, tiÑ
kṛÑ	ti [present agent singularity] (agent) (object)

There are no more rule origins to be selected

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within the set 3.1.91-3.4.117. The following summary of the applications of rules having their origins in the set in control (3.1.91-3.4.117) appears to be empirical evidence for the iteration convention (C5.117) "if in the set 3.1.91-3.4.117 there is more than one rule origin, the statement number of each successive origin is greater than the statement number of the previous origin." In the following summary the number of the rule origin precedes the output string.

(117.132) (a) 3.2.123

verbal root	affix
kṛ̃N	LAṬ [present]

(b) 3.4.69

verbal root	affix
kṛ̃N	LAṬ [present] (agent) (object)

(c) 3.4.78

verbal root	affix, tiN
kṛ̃N	ti [present agent singularity] (agent) (object)

(d) 3.4.113

verbal root	sārvadhātuka, affix, tiN
kṛ̃N	ti [present agent singularity] (agent) (object)

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The next sūtra which is traditionally applied to a string such as (117.132) (d) to output (119.133) is 3.1.79, given as the origin in the following.

(118.133)
- H1.4.23 "when there is that which is doing"
- 1.4.49 "that which is most wished to be obtained by the agent is object (karman)"
- 1.4.54 "the independent one is agent (kartṛ)"
- H3.1.1
- 3.1.79 "after tan etc. [verbal roots of the so-called eighth class] or kṛÑ. before a sārvadhātuka, when agent (kartṛ) - u"
- H3.1.91
- 3.4.117
- 5.4.160

(119.133)

verbal root		sārvadhātuka, affix, tiÑ
kṛÑ	u	ti
	[agent]	[present agent singularity]
		(agent)
		(object)

There are the following interesting characteristics in the selection of 3.1.79 as the origin of the next rule to be applied. Statement 3.1.79 is higher in the grammar than the set (3.1.91-3.4.117) which has been in control. Also, statement 3.1.79 contains the condition that a string is assigned the name sārvadhātuka. The assignment of the name sārvadhātuka to the string ti is not only the result of the last rule to be applied

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but it is the result of the last rule having its origin (3.4.113) within the set (3.1.91-3.4.117) which has been in control. Thus, there is no indication whether the origin 3.1.79 is selected (1) immediately upon the existence of the necessary conditions in the string or (2) after all rules having their origins in the set in control (3.1.91-3.4.117) are completed and the necessary conditions in the string exist.

The set of statements in control of (117.132), i.e., the set 3.1.91-3.4.117 which contained the origins of the rules which yielded the strings in (117.132), is contained within the larger set 3.1.1-5.4.160. Thus, the traditional selection of 3.1.79 may be considered the selection of the origin of a rule which is located higher in the set of statements (3.1.1-5.4.160) which contains the set (3.1.91-3.4.117) which has been in control.[1] The problem is whether (1) statements 3.1.5-90 examine the output of every rule having its origin in the set 3.1.91-3.4.117 and thus in some sense

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[1]It is interesting to note that in the generation of cāyakāya the selection of the origin 6.1.78 in (109.127) occurred after all rules having origins in the set in control, 6.4.1-7.4.97, were executed. Note, however, that there is no traditional interpretation that statements 6.1.1-6.3.139 (the sūtra immediately preceding 6.4.1) are in a larger set which also contains the set 6.4.1-7.4.97. An analysis of the traffic relating to statements 6.4.1-8.4.68 may lead to a more consistent and interesting specification of the traffic rules of the entire grammar.

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interrupt the control by the set 3.1.91-3.4.117 or (2) statements 3.1.5-90 examine the string yielded by the last rule having its origin in the set 3.1.91-3.4.117 and thus the control by that set is preserved. The discussion of this problem will be returned to later.

The sūtra traditionally given (e.g., Vasu 1891:1290) to specify the next replacement operation on a string such as (119.133) kṛ u ti is 7.3.84 "before a sārvadhātuka or an ārdhadhātuka - guṇa." This is the origin of a rule which transforms the string (119.133) kṛ u ti into kar u ti. This presupposes (1) that the kṛ of kṛ u ti has been assigned the name base (aṅga) and control is passed to the base set 6.4.1-7.4.97 and (2) the u of kṛ u ti has been assigned the name ārdhadhātuka by 3.4.114. Thus, after the placement of the u by the rule having its origin at 3.1.79, that u, because it does not satisfy 3.4.113 "a tiṄ or that which has ś as it is sārvadhātuka" must be assigned the name ārdhadhātuka by 3.4.114 "the remainder are ārdhadhātuka." The sequence of these rule origins and the accompanying transforms necessary to complete the generation of karoti is given below, where the number of the rule origin precedes the output. The input to (120.136) (a) is (119.133).

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(120.136) (a) 3.4.114

verbal root	ārdha-dhātuka	sārvadhātuka, affix, tiÑ
kṛ	u	ti
	[agent]	[present agent singularity] (agent) (object)

(b) 1.4.13

base	ārdha-dhātuka	sārvadhātuka, affix, tiÑ
kṛ	u	ti

(c) 7.3.84

base	ārdha-dhātuka	sārvadhātuka, affix, tiÑ
kar	u	ti

(d) 1.4.13

base	sārvadhātuka, affix, tiÑ
karu	ti

(e) 7.3.84

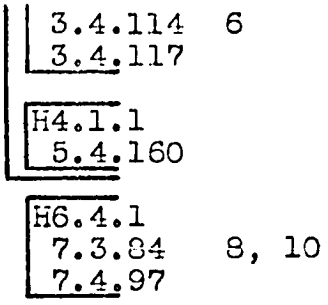
base	sārvadhātuka, affix, tiÑ
karo	ti

The complete sequence of rule origins may be seen below, where the single numbers to the right of the origin numbers represent the order of the rule origin selection.

(121.136) 1.4.13 7, 9

- H3.1.1
  - 3.1.79 5
  - H3.1.91
    - 3.2.123 1
    - 3.4.69 2
    - 3.4.78 3
    - 3.4.113 4

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Concerning the sequence 4, 5 and 6 (3.4.113, 3.1.79 and 3.4.114) there appear to be two possible traffic interpretations. The first is that the rules having their origins in 3.1.5-90 (i.e., 3.1.79 in our example) examine the output of every rule having its origin in the set 3.1.91-3.4.117. If one of the rules having its origin in 3.1.5-90 is satisfied by the output of one of the rules having its origin in the set 3.1.91-3.4.117, then that rule having its origin in 3.1.5-90 applies and thus temporarily interrupts the control by the set 3.1.91-3.4.117. Control is immediately returned for possible selection to the subset containing the rule origin (i.e., 3.4.113 in our example) last selected in the set 3.1.91-3.4.117. A second possibility is that the naming statements 3.4.113-117 are common to all the statements 3.1.5-3.4.112 and thus examine the output of rules having their origins in 3.1.5-3.4.112. The discussion of these two possible interpretations will continue after the discussion of some more generations.

In the generation of the passive counterpart of karoti the affix (pratyaya) LAṬ may be selected to

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be placed by 3.2.123 after the verbal root kṛÑ as in (111.128). The origin of the next rule is also 3.4.69 as it is in (112.130). Thus, at this stage of generation there is no difference between the generation of karoti and the generation of its passive counterpart, for they both have the same rules and the same string as shown below, where the number of the rule origin precedes the output.

(122.138) (a) 3.2.123

verbal root	affix
kṛÑ	LAṬ [present]

(b) 3.4.69

verbal root	affix
kṛÑ	LAṬ [present] (agent) (object)

The origin of the next rule may also be 3.4.78 as it is in (79.104) in the above generation of karoti, but the component statements of the rule expressed in (79.104) differ in the following ways: there is 1.3.13 "when bhāva ("impersonal") or object (karman) - the ātmanepada" instead of 1.3.78 "after the remainder, when agent - the parasmaipada," and there is 1.4.100 "taÑ, āna is ātmanepada" instead of 1.4.99 "in place of L is parasmaipada." Statements 1.4.21-22 and 1.4.105-108 will depend upon the number and person of the object. The output of the kāraka set 1.4.23-55 remains the same: the term object and the term agent.

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The components of the rule, the input and the output are respectively presented in the following.

(123.139)

1.3.12
1.3.13 "when bhāva or object - the ātmanepada"
1.3.93

1.4.21
1.4.22 "when duality or singularity - the dual or the singular"

H1.4.23 "when there is that which is doing"
1.4.49 "that which is most wished to be obtained by the agent is object"
1.4.54 "the independent one is agent"

1.4.99
1.4.100 "taÑ, ān- is ātmanepada"

1.4.101 "the three triplets of tiÑ [elements listed at 3.4.78] are third person, second person, first person (respectively)"

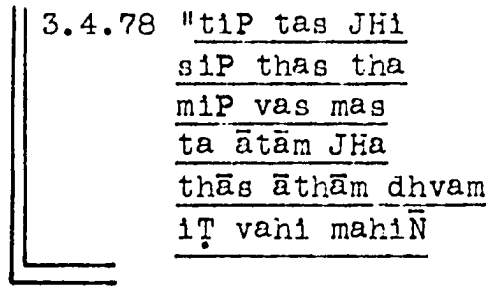
1.4.102 "those (elements of each triplet) of tiÑ [elements listed at 3.4.78] are, one by one - singular, dual, plural"

1.4.105
1.4.108 "in the remainder [i.e., other than those conditions specified by 105-107] - third person"

H3.1.1 (pratyaya$_1$) "affix"
H3.1.2 "and follows"
H3.1.3 "and has high pitch on first syllable"
H3.1.4 "[but] sUP or that which has P as it is low-pitched"

H3.1.91 (dhātu$_5$) "after a verbal root"
H3.1.92 "here, that which is referred to by the term in the seventh case is upapada"
H3.1.93 "primary affix (kṛt) is that which is not a tiÑ"
3.4.77 "in the place of L"

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(124.140) INPUT:

verbal root	affix
kṛÑ	LAṬ [present] (agent) (object)

(125.140) OUTPUT:

verbal root	affix, tiÑ, ātmanepada
kṛÑ	ta Ṭ [present agent singularity] (agent) (object)

The selection of the ātmanepada set of endings is determined by the choice of the term object (karman) instead of the term agent (kartṛ). The existence of both of these terms is specified by the kāraka set 1.4.23-55 and, in our particular verbal root under consideration, there is optionality between 1.3.13, which selects the object and 1.3.78, which selects the agent. The term ātmanepada is defined by 1.4.100 as the set of elements composed of the last nine elements of 3.4.78, which is the origin of the rule, and the element āna. The intersection of the ātmanepada, the singular and the third person sets is ta.

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The last two rule origins to be selected in the set 3.1.91–3.4.117 are 3.4.79 and 3.4.113. The components of these rules, followed by their respective outputs, are presented below.[1]

(126.141) 1.1.64 "that which begins with the last vowel is ṭi"

1.4.100 "taÑ, ā̲na is ātmanepada"

3.4.79 "in the place of ṭi of an ātmanepada [element] which is in the place of that which has the it T̲ - e̲"

verbal root	affix, tiÑ, ātmanepada
kṛÑ	te
	present object singularity

(127.141)

(128.141) 3.4.113 "a tiÑ or that which has s̲ as it is sārvadhātuka"

verbal root	sārvadhātuka, affix, tiÑ, ātmanepada
kṛÑ	te
	present object singularity

(129.141)

The sequence of rule origins selected within the 3.1.91–3.4.117 set has been 3.2.123, 3.4.69, 3.4.78, 3.4.79 and 3.4.113.[2] Compared to the sequence of rule

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[1]The referential symbols (agent) and (object) are dropped merely to save space. They are, of course, in the rule (112.130) in the derivational history.

[2]This sequence of rule origins is empirical evidence for the iteration convention (C5.117).

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origins 3.2.123, 3.4.69, 3.4.78 and 3.4.113 in the generation of karoti, this sequence has the additional origin 3.4.79. Rather than simply replacing a by e, the rule having the origin 3.4.79 makes a greater generalization.

Statement 3.4.79 is a general statement concerning the ātmanepada endings which are the replacements of six affixes (LIṬ, LAṬ, LṚṬ, LUṬ, LOṬ and LEṬ) all having a tense or modal signification and all characterized by the it Ṭ, the feature by which they are recognized in statement 3.4.79. Statement 3.4.79 is the origin of a general (utsarga) rule which is followed by origins of apavāda rules, i.e., rules which apply in specific domains of the general rule 3.4.79. Thus, given the input verbal root followed by ta Ṭ, ātām Ṭ or JHa Ṭ the general rule having its origin at 3.4.79 will respectively output te, āte or JHe.

There is an additional difference between the rules applied at this point in the generation of our passive verb and the rules having origins at 3.2.123, 3.4.69, 3.4.78 and 3.4.113 in the corresponding generation of karoti. As noted above, although both rules contain the rule origin 3.4.78, they are different. One contains 1.3.13 "when bhāva or object (karman) - the ātmanepada" and the other contains 1.3.78 "after the remainder, when agent (kartṛ) - the parasmaipada."

The next sūtra which is traditionally applied

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to (129.141) is 3.1.67, given as the origin in the following.

(130.143)
- H1.4.23 "when there is that which is doing"
- 1.4.49 "that which is most wished to be obtained by the agent is object (karman)"
- 1.4.54 "the independent one is agent (kartṛ)"
- H3.1.1
- 3.1.67 "before a sārvadhātuka, when bhāva or object (karman) - yaK"
- H3.1.91
- 3.4.117
- 5.4.160

	verbal root		sārvadhātuka, affix, tiÑ, ātmanepada
(131.143)	kṛ	yaK [object]	te [present object singularity]

Similar to the u of kṛÑ u ti of (119.133), the yaK of (131.143) is assigned the name ārdhadhātuka by 3.4.114. The verbal root kṛ is called a base (aṅga) by 1.4.13 and control is passed to the base set 6.4.1-7.4.97. Although the affix yaK is an ārdhadhātuka, 7.3.84 "before a sārvadhātuka or ārdhadhātuka - guṇa" is not applied because 1.1.5 prohibits guṇa or vṛddhi before that which has a K or Ñ as it. Statement 7.4.28 replaces the final ṛ before yaK by ri. Thus the passive kriyate "it is made" is formed.

As 3.1.79 of (118.133) is, 3.1.67 of (130.143)

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is higher in the grammar than the set (3.1.91-3.4.117) which has been in control and contains the condition that a string is called sārvadhātuka. Both (116.131) and (129.141), the inputs to (118.133) and (130.143) respectively, were assigned the name sārvadhātuka by the immediately previously applied rule which also was the last rule having its origin (3.4.113) within the set (3.1.91-3.4.117) which has been in control.

Although the existence of the term object (karman) is, according to 1.3.13, the condition specifying the term ātmanepada in (123.139), the affix (pratyaya) ta[1] in (125.140) (or the affix te in (127.141)) does not necessarily always express what is referred to in Western grammar as "passive." For example, the affix ta (te) may be specified by a lexical-syntactic condition such as the lexical items ni and viś and the position after in 1.3.17 "after the verbal root viś preceded by ni - the ātmanepada." Thus, in the generation of the two passive forms viśyate "it is entered" and niviśyate "it is entered in" and the two active forms niviśate "he enters in" and viśati "he enters," the ātmanepada affix does not indicate the form expressing the object (or the "passive"). This may be seen in (132.145) which shows the specification of the ātmanepada by

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[1]The ātmanepada-parasmaipada set 1.3.12-93 specifies not a particular affix but rather either the ātmanepada set defined by 1.4.100 or the parasmaipada set defined by 1.4.99.

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1.3.13 and by 1.3.17, where (c) niviśate "he enters in" is not passive, and the specification of the parasmaipada by 1.3.78. Statements 1.3.13, 1.3.17 and 1.3.78, all members of the ātmanepada-parasmaipada set, are parts of rules all having the origin 3.4.78 (the list of tiÑ elements). That the object (karman) is specified by 3.1.67 (and thus the expression of the "passive") and the agent (kartṛ) by 3.1.68-83[1] is evident from (133.145).[2]

(132.145) 3.4.78:

		1.3.13	1.3.17	1.3.78
(a)	viś	ta		
(b)	ni viś	ta		
(c)	ni viś		ta	
(d)	viś			ti

(133.145)

	3.1.67	3.1.77				
(a)	yaK		viś	yaK	te	viśyate
(b)	yaK		ni viś	yaK	te	niviśyate
(c)		Śa	ni viś	Śa	te	niviśate
(d)		Śa	viś	Śa	ti	viśati
	object	agent				

Thus the "passive" is expressed by the placement of a string with the signification of the object by 3.1.67 after control has been passed from the 3.1.91-3.4.117 set. If the agent is to be expressed (placed)

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[1]The affix expressing the agent depends either on the class of verbal roots to which the verbal root under consideration belongs in the Dhātupāṭha or on a specific verbal root. See Shefts 1961:4-5 for 3.1.68, 69, 73, 74 and 77-81.

[2]The a of ta is replaced by e according to the rule expressed in (126.141).

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in the verb string it is placed by a rule, the origin of which is one of the statements 3.1.68-83 depending either on the class of verbal roots to which the verbal root (dhātu) under consideration belongs or on the specific verbal root under consideration.

In the activity of making a mat if the verb string expresses the agent (kartṛ) as in (119.133), then the agent may or may not be named (lexically represented). If it is named, the nominative case-ending is placed according to 2.3.46 "when there is to be designated nothing but the gender and the number of the sense of the nominal stem (prātipadika) - the nominative (first)" because it (the gender and number of the sense of the nominal stem) is, according to H2.3.1, "not placed." Thus the nominative singular case-ending is selected by the rule having its origin at 4.1.2 (sUP). The rule will have the same component statements as those expressed in (73.99) except there will be 2.3.46 instead of 2.3.2. The accusative case-ending will be placed to express the object also by the rule having its origin at 4.1.2. The component statements of this rule are expressed in (73.99). Thus, if the agent (kartṛ) is "Devadatta" and the object (karman) is the "mat," the lexical representations of the agent and the object are the string referents of the L. The output of (112.130) with the origin 3.4.69 is the string given again as (134.147)

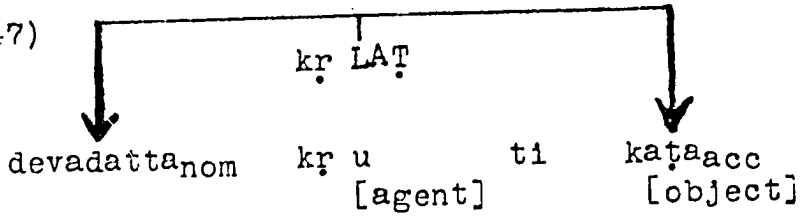
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below, showing that the L in one stage of the generation of karoti has referents which are distinguished by the concepts "agent" and "object."

(134.147) kṛ LAṬ
[present]
(agent)
(object)

In a later stage, (119.133), in the generation of the "active" karoti the string u is placed to express the concept "agent." In the generation of kaṭam "mat" the accusative case-ending (second) is placed with the concept "object." Thus the following shows (1) the string referents of the L and (2) a combination of strings.

(135.147)

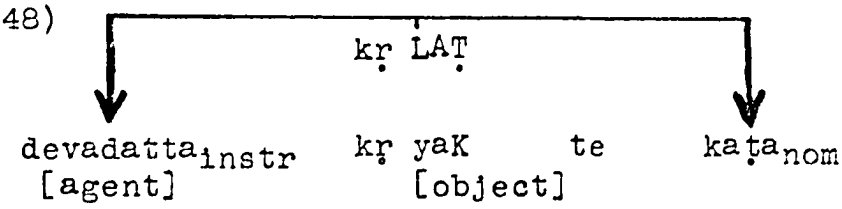


In the generation of the corresponding "passive" there is also (134.147), but the string yaK is placed to express the concept "object" by the rule expressed in (130.143). If the object (karman) is named, its lexical representation is placed in the nominative case-ending according to 2.3.46 "when there is to be designated nothing but the gender and the number of the sense of the nominal stem (prātipadika)" because it (the gender and number of the sense of the nominal stem) is, according to H2.3.1, "not placed." The

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string representing the agent is placed in the instrumental case according to 2.3.18 "when agent (kartṛ) or helper (karaṇa) - the instrumental (third)" because it is, according to H2.3.1, "not placed." Thus the structure contrasting with (135.147) above will be (136.148) below. We note that in both the "active" and the "passive" the lexical referents of the L are the same but that the grammatical expressions of the agent and the object are differert.

(136.148)



Let us now consider the generation of a causative verb. Given the verbal root kṛ̃N "do, make," by set selection convention (C4.114) the next non-naming rule to be applied is contained within the set 3.1.91-3.4.117 which has the heading statement "after a verbal root." Let us assume that the output of the last rule having its origin in this set is the string (116.131) kṛ̃N ti. The affix ti will have been selected according to person and number. According to the traffic pattern of the active and passive generations of karoti and kriyate, the origin of the next rule to be selected should be within the set 3.1.5-90.

There are two affixes in this set which must be placed in the string kṛ̃N ti. One implies that there is

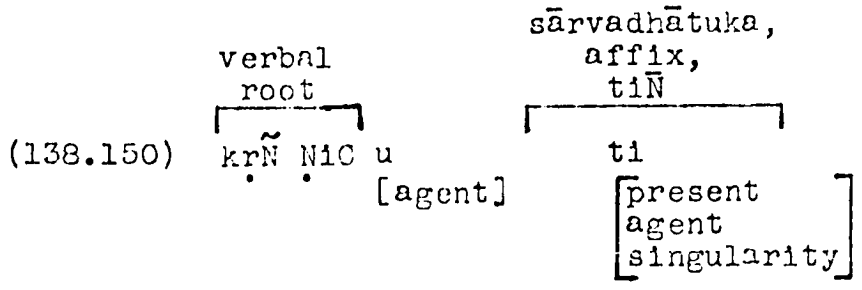
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cause (hetu) and the other is placed to express the agent (kartṛ). If statement 3.1.79 is selected, the string (119.133), given again below, is obtained. This string, from which the active karoti is obtained, expresses the agent of the simple non-causative verb karoti "he makes." The affix ti expresses the person and number in respect to the agent of the non-causative verb.

	verbal root		sārvadhātuka, affix, tiÑ
(137.149)	kṛÑ	u	ti
		[agent]	[present agent singularity]

If 3.1.26 "when effect (consequence, hetumat) - ṆiC" is selected to imply the cause (hetu), the affix ṆiC is placed, according to H3.1.2 "and follows," after the substring which has been focused on, i.e., after the verbal root kṛÑ. The new string is now kṛÑ ṆiC u ti. The origin of the next rule is (23.49) 3.1.32 "those which have final saN etc. are verbal roots." Because ṆiC is one of the affixes enjoined by the list of statements beginning with statement 3.1.5, which enjoins saN, and ending with the immediately previous statement 3.1.31; statement 3.1.32 assigns the name verbal root (dhātu) to the string kṛÑ ṆiC. The resulting string is the following.

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According to set selection convention (C4.114), control is passed to the set 3.1.91-3.4.117 where, let us say, the affix LAṬ is placed, according to H3.1.91 "after a verbal root (dhātu)," after krÑ ṆiC by the rule having its origin at 3.2.123. The new string is now krÑ ṆiC LAṬ u ti. Formally, 3.4.69 "the Ls - when agent (kartṛ) and object (karman) or when agent and bhāva after that which does not have an object" should apply. However, there is no indication whether the agent of the causative or the agent of the non-causative is specified; for whereas the causative verb is supposedly being generated and thus its agent should be the one intended by 3.4.69, there is already the string u which expresses the non-causative agent. Provided this problem could be circumvented, after 3.4.69 the rule having its origin at 3.4.78 will select, let us say, the third person plural affix JHi. The resulting string is krÑ ṆiC JHi u ti.

Statement 3.4.114 will assign the name sārvadhātuka to the affix JHi and control will pass to the set 3.1.5-90. The affix ŚaP will be placed by the rule having its origin at 3.1.68 "when agent (kartṛ), before

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a sārvadhātuka - ŚaP" to express the agent of the causative verb. The resulting string of formatives, obviously ill-formed and which cannot be corrected by rules of the grammar, is the following.

(139.151)

kṛÑ	NiC	ŚaP	JHi	u	ti
	(cause)	[agent of causative]	[pl.]	[agent of non-causative]	[sing.]

Thus, there appears no way to form a causative verb directly from the formatives which have been placed to represent the non-causative verb.

In order to understand the construction of the causative verb, let us turn our attention to the kāraka set 1.4.23-55. Given a verbal activity, this set of statements analyzes those things which are participating in the given activity. For example, given the activity of Devadatta cooking rice, the rice is analyzed as the object (karman) because, according to 1.4.49, it is "that which is most wished to be obtained by the agent" in the activity. Devadatta is analyzed as the agent (kartṛ) because, according to 1.4.54, he is "the independent one" in the activity. The output of the kāraka set are the terms object and agent respectively having referents "rice (odana)" and "Devadatta." The following expresses this information, which is in the format T:C:R, where T stands for the term (e.g., object), C stands for the statement number indicating the concept by which the existence of the referent of that term is

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established (e.g., 1.4.49 indicating "that which is most wished to be obtained by the agent") and R stands for the referent.

(140.152) object (karman) : 1.4.49 : "rice (odana)"
agent (kartṛ) : 1.4.54 : "Devadatta"

Because there is the verbal root pac "cook," according to the set selection convention (C4.114) control is passed to the set 3.1.91-3.4.117. If there is no causative construction (i.e., no cause (hetu)), then pacati odanaṃ devadattaḥ "Devadatta cooks rice-gruel" or pacyate odano devadattena "the rice-gruel is cooked by Devadatta" is generated according to the previous discussion from (111.128) - (136.148).

If, however, there is a cause (hetu) of the above activity analyzed by the kāraka set, statement 1.4.55 "the instigator of that is cause (hetu) as well as agent (kartṛ)" is satisfied. This statement specifies that the cause both instigates the agent of the non-causative activity and is the agent of the new (causative) activity.[1] At the point that control is passed to the verbal root set 3.1.91-3.4.117 because there is the verbal root pac, the participants in the activity are the following.

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[1]However, whether the term tat "that" in 1.4.55 refers to the agent of the non-causative activity or to the non-causative activity itself remains to be shown. In this study we assume without justification the traditional interpretation that it refers to the agent of the non-causative activity.

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(141.153) object (karman) : 1.4.49 : "rice (odana)"
agent (kartṛ) : 1.4.54 : "Devadatta"
cause (hetu) and agent (kartṛ) : 1.4.55 : "gods (deva)"
pac "cook"

It appears that there is a convention wherein a cause (hetu) must have an effect (consequence, hetumat); for the (non-causative) verbal activity is considered the consequence of the cause. This is indicated by the origin of the next rule to be applied. This is 3.1.26, expressed below with output (143.153).

(142.153)
H3.1.1 "affix"
H3.1.2 "and follows"
H3.1.3 "and has high pitch on first syllable"
H3.1.4 "[but] sUP or that which has P as it is low-pitched"

3.1.26 "When effect (consequence, hetumat) - ṆiC"

H3.1.91

3.4.117

5.4.160

(143.153) pac ṆiC
[effect]

The statement selected as the origin of the next rule is (23.49) 3.1.32 "those which have final saN etc. are verbal roots." This names the string pac ṆiC a verbal root.

(144.153)
verbal root
pac ṆiC
[effect]

Now that the activity having the participants

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expressed in (141.153) is considered an effect (hetumat) and that there is a new verbal root (dhātu), the kāraka set 1.4.23-55 analyzes the activity associated with that new verbal root. This analysis is shown in (145.154) below, where the kāraka terms associated with participants of the previous activity (i.e., where the verbal root was pac) remain as they were specified by the analysis of that activity unless they are changed by this analysis. Thus, Devadatta, the agent of the previous activity, is analyzed as the object of the activity under consideration (i.e., the causative activity). The rice, previously analyzed as the object of the verbal root (dhātu) pac, remains the same. Because there are now in the activity two objects, "Devadatta" and "rice (odana)," and it is necessary to distinguish which object is the object that is the result of the analysis of the activity associated with the verbal root under consideration, we shall, for the sake of clarity,[1] precede this principal object with an asterisk.

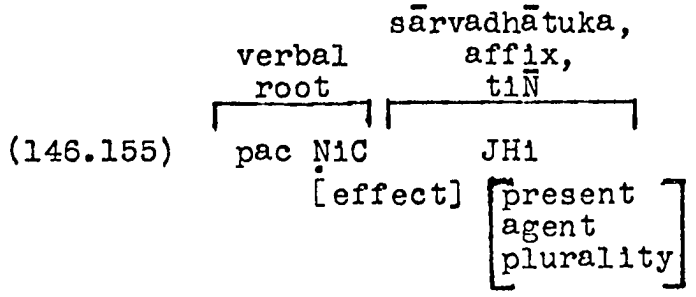
(145.154) object (karman) : 1.4.49 : "rice (odana)"
*object (karman): 1.4.49 : "Devadatta"
agent (kartṛ) : 1.4.54 : "gods (deva)"
pac ṆiC

According to the set selection convention (C4.114) in regard to the new verbal root, control is passed to the 3.1.91-3.4.117 set. To generate the active finite causative verb the rule origins in this set will be the same as those of (117.132) in the

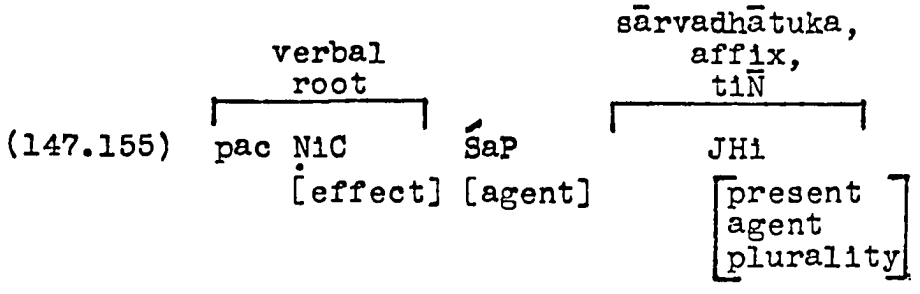
[1]The derivational history, however, indicates this.

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generation of a non-causative verb. The last rule having its origin in this set will be 3.4.113, which will output the following.



As with the generation of the non-causative active karoti, this output, the output of the 3.1.91-3.4.117 set, is examined by statements located higher in the set of statements (3.1.1-5.4.160) which contains the set (3.1.91-3.4.117) which has been in control. It should be noted that the statements examining the output of the 3.1.91-3.4.117 set are, more accurately, 3.1.33-90; for statements 3.1.5-32, producing new verbal roots, examine strings yielded by a rule not having its origin in the 3.1.91-3.4.117 set. Statement 3.1.68 "when agent, before a sārvadhātuka - śaP" is selected and the string (146.155) is transformed into the following.



This string of formatives is the input to a

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series of rules. The final form is pācayanti. The results of the generations of the representations of the other participants in the activity as analyzed in (145.154) are shown in the following presentation of formatives.

(148.156) deva_{nom} $\text{devadatta}_{\text{acc}}$ $\text{odana}_{\text{acc}}$
[object] [object]

pac NiC ŚaP JHi
[effect] [agent] [present agent plurality]

The accusative case-ending (second) is placed after odana "rice" by a rule having its origin at 4.1.2 and containing statement 2.3.2 "when object (karman) - the accusative case-ending (second)" with H2.3.1 "when not placed." The accusative case-ending (second) is placed after devadatta-, the lexical representation of the principal object (karman) of the causative activity, because it is analyzed as the object and no string has been placed to express the principal object. Because the string ŚaP has been placed in the verb to express the agent, the instrumental case-ending (third) cannot be placed after deva, the lexical representation of the agent of the activity according to 2.3.18 "when agent (kartṛ) or helper (karaṇa) - the instrumental (third)." However, the nominative case-ending (first) is placed after deva-, the lexical representation of the gods, according to 2.3.46 "when there is to be designated

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nothing but the gender and the number of the sense of the nominal stem (prātipadika)." Thus the sentence devā devadattam odanaṃ pācayanti "the gods cause Devadatta to cook rice" is generated from the formatives shown in (148.156) above.

Let us now consider the generation of devair devadatta odanaṃ pācyate "Devadatta is caused by the gods to cook rice," which is the passive counterpart of the formatives generated above. The same analysis by the kāraka set, presented in (145.154) above, holds. The formatives of this "passive" of the causative are shown in the following.[1]

(149.157) $\underset{\text{[agent]}}{\text{deva}_{\text{instr}}}$ $\text{devadatta}_{\text{nom}}$ $\underset{\text{[object]}}{\text{odana}_{\text{acc}}}$

pac ṆiC yaK te

[effect] [object] [present object singularity]

The accusative case-ending (second) is placed after odana- "rice" because it does not represent the principal object of the causative activity. Parallel to the object kaṭa in (136.148) in the generation of a non-causative passive construction, devadatta- is the lexical representation of the principal object, as may be seen in presentation (145.154) of the activity under consideration, and has the nominative case-ending (first) placed after it according to 2.3.46 because the

[1]The formative ṆiC is elided by statement 6.4.51.

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string yaK is placed in the verb string to express the object but the gender and number of the sense of the nominal stem devadatta has not been placed. Because no string has been placed to express the agent, the instrumental case-ending (third) is placed after deva-, the lexical representation of the agent, according to 2.3.18 "when agent (kartṛ) or helper (karaṇa) - the third."

Concerning the generation of a verbal element from a given verbal root, the "actives" (causative and non-causative) and the "passives" (causative and non-causative) have the same pattern of rule origin selection from statements 3.1.33-90 and 3.1.95-3.4.117. The order of selections of rule origins prior to the application of the first rule having its origin in the verbal root set 3.1.91-3.4.117, which operates on the string pac ṆiC, was presented in the previous discussion of (140.152) - (145.154). This order, favored in this study, is summarized in the following.

(150.158) (a) Analysis of the activity associated with verbal root pac by kāraka set 1.4.23-55 results in:

object (karman) : 1.4.49 : "rice (odana)"
agent (kartṛ) : 1.4.54 : "Devadatta"
cause (hetu) and agent (kartṛ) : 1.4.55 : "gods (deva)"
pac "cook"

(b) Set selection convention (C4.114) passes control to the 3.1.91-3.4.117 set on the basis of pac being a verbal root.

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(c) Examination of the string pac by rules having origins higher in grammar but in the set of statements (3.1.1-5.4.160) which contains the set (3.1.91-3.4.117) which has been in control. Application of the statement 3.1.26 results in pac Ṇi C.
[effect]

(d) Assignment of name verbal root (dhātu) to pac Ṇi C by statement 3.1.32.

(e) Analysis of new activity by kāraka set 1.4.23-55 results in:

object : 1.4.49 : "rice (odana)"
*object : 1.4.49 : "Devadatta"
agent : 1.4.54 : "gods (deva)"
pac Ṇi C

(f) Set selection convention (C4.114) passes control to the set 3.1.91-3.4.117 on the basis of pac Ṇi C being a verbal root.

In (150.158) (a) and (e) above, the kāraka set 1.4.23-55 analyzes an activity associated with a verbal root (dhātu). This analysis occurs after the existence of a new verbal root is established. That the kāraka set analyzes the participants in an activity associated with a verbal root is evident in the mentioning of specific verbal roots in certain statements in the kāraka set, e.g., in statements 1.4.25 "the cause (hetu) for fear of the senses bhī ["fear"] and trā ["protect"] is apādāna" and 1.4.46 "the locus of the activity of the verbal root sthā ["exist, stand"], śīṄ ["lie, rest"] or ās ["exist, sit"] with the preverb adhi ["over, upon"] is object (karman)." This appears to be empirical

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evidence that the assignment of the name verbal root (dhātu) to pac ṆiC by 3.1.32 in (150.158) (d) occurs before the analysis of the activity associated with that verbal root in (150.158) (e).

There is evidence that some statements in the base set 6.4.1-7.4.97 may be applied immediately after the ṆiC has been placed. Buiskool 1939:8 states that

> it may occur that the notions "root" and "stem" [base] cover one another and even that the stem forms part of the root. Thus in the development √cur + ṇic (III 1 25) + çap [śaP] (III 1 68) + tiṬ (> curiati > coriati (VII 3 86) > coreati (VII 3 84) > corayati (VI 1 78)) cur is (original) root, as well as stem [base, aṅga] (with regard to ṇic), as well as part of the derived root curi (cori).

Buiskool's discussion indicates that cur ṆiC is transformed into cor ṆiC by 7.3.86. One condition in 7.3.86 is "before a sārvadhātuka or ārdhadhātuka." Thus ṆiC must be assigned the name ārdhadhātuka by 3.4.114. This indicates that name assignment statements 3.4.113-117 apply to any and all affixes (pratyayas) which are the final output of statements 3.1.5-3.4.112. Thus, after the placement of ṆiC by 3.1.26 at (150.158) (c) 3.4.114 applies to assign the name ārdhadhātuka to the affix ṆiC.

Whether the formatives are first built up as Misra 1966:35 indicates[1] or whether the placement of

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[1] Cf. footnote 1, p. 126.

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an affix (pratyaya) is followed by the application(s) of the 6.4.1-8.4.68 operations relating to that affix is a problem that this study only points out. It is interesting, however, that sūtra 3.1.138 specifies the (causative) verbal roots "dhāri, pāri, vedi" etc. themselves rather than, e.g., "dhṛ followed by ṆiC." This may indicate that Pāṇini presupposed that the statements in the base set 6.4.1-7.4.97 apply to a verbal root followed by ṆiC before the verbal root set 3.1.91-3.4.117 begins operating on the verbal root dhṛ ṆiC (or, e.g., pac ṆiC). However, this can only be determined after extensive investigations into the traffic rules regulating the selection of rule origins in statements 6.1.1-8.4.68.

If one does not apply the set selection convention (C4.114) to pass control to the 3.1.91 set on the basis that pac is a verbal root as in (150.158) (b); then there is no justification for selecting 3.1.26 in (150.158), for its heading statements 3.1.1-2 only specifies that an affix follows but does not specify what it follows. Also, set selection convention (C4.114) seems to be fairly general throughout the grammar.

Statement 3.1.26 in (150.158) (c) interrupts the control of the lower set 3.1.91-3.4.117 so that control is transferred to the higher statements 3.1.5-32; for the origin of the next rule applied is

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3.1.32, after which the set selection convention (C4.114) applies again. This is partially paralleled by the selection of the rule having its origin at 6.1.78 in (109.127) which is above the set of statements (6.4.1-7.4.97) that was in control in the generation of cāyaka "gatherer." This interruption of control by statements higher in the grammar than the set currently in control may be an indication of a general traffic characteristic which this study will not pursue but which should be investigated.

The following convention is a summary of the traffic conventions necessary to the discussion in the next chapter.

(C6.162) (a) The assignment of the name N to a string (or substring) specifies that the potential origin of the next non-naming rule to be applied is contained within the set of statements having N as a term in its first heading statement. Control is passed to that set. (This is set selection convention (C4.114).)

(b) Set 3.1.5-32 examines strings yielded by a rule not having its origin in the set 3.1.5-3.4.117. If a condition is satisfied, control is passed to the set 3.1.5-32.

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(c) Set 3.1.33-90 examines the output of the set 3.1.91-3.4.112. If none of these statements is satisfied, control passes from the set 3.1.1-3.4.117. If any one of these statements is satisfied, control passes to the set 3.1.33-90. Control will then pass from the set 3.1.1-3.4.117 after (d) (1) and (2) below are satisfied.

(d) The following apply to any and all of the above sets in control.

(1) Within a set of statements in control (e.g., 3.1.5-32, 3.1.33-90, 3.1.91-3.4.112) if there is more than one rule origin, the statement number of each successive origin is greater than the statement number of the previous origin. (This is a modification of the iteration convention (C5.117).)

(2) Statements 3.4.113-117 apply to any and all affixes (pratyayas) which are the final output of any set in control.

The above traffic converntions are ordered. That

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is, (a) applies before (b) and (b) applies before (c), etc. Thus, although the set 3.1.5-32 may, according to (b), assume control from the set 3.1.91-3.4.112 and 3.1.32 assigns the name verbal root to the string pac ṆiC, control is not immediately passed to the 3.1.91-3.4.112 set according to (a); for (d) (2) must apply so that ṆiC is assigned the name ārdhadhātuka before control is passed to the verbal root set 3.1.91-3.4.112 according to (a).

This chapter has been a description of the basic formal characteristics of the grammar in hopes that it will give us not only a basis for an appreciation of the role the kārakas play in the context of the grammar as a whole but also a basis for further study of the characteristics of this grammar. It should be emphasized that this introduction to the basic formal characteristics should be submitted to rigorous testing, justification and improvement. Let us now turn our attention to the use of kāraka terms in various generations involving rules having their origins in 3.1.5-3.4.117.

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CHAPTER III

THE KĀRAKAS

The Use of Kāraka Terms in Generations

The output of the kāraka set is one or more terms which have referents recognized by the conditions (or concepts) in the definientia of statements 1.4.24-55. The use of the kāraka terms in rules having their origins in other sets of statements is a notational device to represent their respective referents. Although these terms are located in various sets of statements (e.g., in sets respectively dealing with compounds and secondary affixes), this discussion centers on the generations of forms by rules having origins in 3.1.5-4.1.2.

The last section of the preceding chapter discussed the basic method of generating finite verbs. The use of kāraka terms in the selection of a declensional ending (sUP) has been mentioned in the preceding chapter; examples of additional kāraka terms will be given in the following discussion on the kāraka set itself. This section discusses the generation of participles.

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Given the activity of Devadatta making a mat, in the generation involving the verbal root (dhātu) kṛ "do, make" control is passed to the verbal root set 3.1.91-3.4.112 according to the set selection convention (C6.162) (a) on the basis of the element kṛ being called a verbal root. The origin of the rule selected may be 3.1.96. The pertinent components of this rule and the output are respectively presented in (151.166) and (152.166) below. We note that the set of kṛtya affixes is a subset of the set of primary affixes (kṛt), which is a subset of the set of affixes (pratyaya). This is specified by H3.1.95, H3.1.93 and H3.1.1.

(151.166)

H3.1.1	"affix (pratyaya)"
H3.1.2	"and follows"
H3.1.91	"after a verbal root"
H3.1.93	"primary affix (kṛt) is that which is not a tiÑ"
H3.1.95	"kṛtyas up to 3.1.133 (exclusive)"
3.1.96	"tavyaT, tavya, anīyaR"

(152.166)

verbal root	affix, primary affix, kṛtya
kṛÑ	tavya

The origin of the next rule, selected in accordance with the iteration convention (C6.162) (d) (1) is 3.3.171, given below with corresponding output. Although a literal translation of this statement is "when necessity or indebtedness - kṛtya affixes," the meaning is that the kṛtya set of affixes may express

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necessity or indebtedness.[1] We note that H3.1.92 "here, that which is referred to by the term in the seventh (locative) case is upapada" does not pertain to the Sanskrit words for necessity or indebtedness which are inflected in the seventh case in statement 3.3.171 because an entity (referent) cannot be recognized by either of these words.

(153.167) 3.3.171 "when necessity or indebtedness - kṛtya affixes"

	verbal root	affix, primary affix, kṛtya
(154.167)	kṛÑ	tavya [necessity]

The origin of the next rule selected is 3.4.70. Although the term kṛtya in 3.4.70, like the term Ls in 3.4.69 and the term kṛt (primary affix) in 3.4.67,[2] is inflected in the nominative (first) case in 3.4.70, it is not the name of a set of potential substituentia because the term kṛtya is a name of a set of affixes defined by a heading statement (H3.1.95) which is within the verbal root set 3.1.91-3.4.112 of which the origin 3.4.70 is a member. Thus, given that the kāraka set yields the term object (karman), 3.4.70 with H3.1.92 states that a kṛtya affix indicates that there is a referent which is distinguished by the concept "that

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[1] There are other statements specifying other senses which kṛtya affixes may express.

[2] Cf. supra, p. 129 and 115-16 respectively.

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which is most wished to be obtained by the agent," for which the term object is a symbol.

(155.168) Analysis by kāraka set:
object (karman) : 1.4.49 : "mat (kaṭa)"
agent (kartṛ) : 1.4.54 : "Devadatta"

H3.1.1 "affix"

H3.1.91 "after a verbal root"
H3.1.92 "here, that which is referred to by the term in the seventh case is upapada"
3.4.70 "when object (karman$_7$) or bhāva - kṛtya affixes, Kta and those that have sense of KHaL"

(156.168)

verbal root	affix, primary affix, kṛtya
kṛÑ	tavya [necessity] (object)

The next rule origin to apply is 3.4.114 which assigns the name ārdhadhātuka to the affix tavya. This is the last origin of a rule to apply within statements 3.1.5-3.4.117. If the string kṛÑ tavya is now called a nominal stem (prātipadika) by 1.2.46 because it ends in a primary affix (kṛt), control will pass according to set selection convention (C6.162) (a) to the 4.1.1-5.4.160 set. This will allow the placement of a declensional ending (sUP) by a rule having its origin at 4.1.2. The agent devadatta would be placed in the instrumental case by a rule having its origin at 4.1.2 and including statements H2.3.1 "when not placed" and 2.3.18 "when agent or helper - the instrumental." However, it is necessary to allow the generation of devadattasya

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kaṭaḥ kartavyaḥ "Devadatta ought to make the mat," where Devadatta is optionally placed in the genitive case when it is the agent of a kṛtya affix (which tavya in kṛ̃N tavya is) according to 2.3.71. But, if kṛ̃N tavya is already called a nominal stem on the basis that it has a primary affix (kṛt), of which kṛtya is a subclass,[1] it is necessary in the application of 2.3.71 to examine the structure of that nominal stem kṛ̃N tavya to determine if it contains a kṛtya affix. It seems intuitively unnatural to first name a string a nominal stem on the basis that it ends in a primary affix and then in the rule having its origin at 4.1.2 in the inflection of that nominal stem to examine the internal structure of that nominal stem to determine if it has a particular kind of primary affix. Substantively speaking, it is important that the agent devadatta is a participant in the activity associated with the verbal root kṛ̃N. For this reason kṛ̃N tavya is not called a nominal stem until all strings associated with the activity involving the verbal root kṛ̃N are processed. Thus, the rule[2] having its origin at 4.1.2 and including either 2.3.18 "when agent or helper (karaṇa) - the instrumental" or 2.3.71 "optionally,

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[1]This is indicated by the domain of the definition of primary affix (kṛt) at H3.1.93 being the set 3.1.91-3.4.117 while the domain of the definition of kṛtya is 3.1.95-3.1.132.

[2]This rule is similar in structure to (73.99).

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when agent of kṛtya affixes - the genitive" is applied to the nominal stem[1] devadatta previous to the inflection of kṛ̃N tavya. The two strings under consideration at the time of application of the rule applying the case inflection of devadatta- are the following.

	verbal root	primary affix, kṛtya	nominal stem
(157.170)	kṛ̃N	tavya [necessity] (object)	devadatta

The output is either devadatta ṬĀ (> devadattena) according to 2.3.18 "when agent (kartṛ) or helper (karaṇa) - the instrumental" or devadatta ṆĀs (> devadattasya) according to 2.3.71 "optionally, when agent of kṛtya affixes - the geni ive."[2]

	verbal root	primary affix, kṛtya	nominal stem	affix, (instr)
(158.170) OUTPUT:	kṛ̃N	tavya [necessity] (object)	devadatta	ṬĀ [agent]
OR:	"	"	"	affix, (gen) ṆĀs [agent]

The string kṛ̃N tavya contains the kṛtya sub-

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[1]The form devadatta- itself has signification according to 1.2.45 "that which has signification, not a verbal root, not an affix is a nominal stem (prātipadika)."

[2]The notation (instr) and (gen) above the ṬĀ and ṆĀs in (158.170) indicate that they are respectively the instrumental (third) and genitive (sixth) case-endings.

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string tavya, which satisfies the condition "of kṛtya affixes" in statement 2.3.71 in the application of the rule placing the genitive inflection Ñas after the other string, devadatta. After the inflection of devadatta- the string kṛÑ tavya is assigned the name nominal stem by statement 1.2.46 on the basis that it ends in a primary affix (kṛt).[1]

The following appear to be two possible reasons for the selection of the nominative case for the nominal stem kaṭa "mat" according to 2.3.46 "when there is to be designated nothing but the gender and the number of the sense of the nominal stem - the nominative." (159.171) Because the substring tavya of the nominal stem kṛÑ tavya already denotes the object according to 3.4.70 (cf. (155.168)), the object is considered placed (according to

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[1]It should be noted that the sequence of operations may be the following: (1) the set 3.1.1-3.4.117 outputs the string kṛÑ tavya, (2) control passes from the set 3.1.1-3.4.117 but not from the set 3.1.1-5.4.160, (3) the string kṛÑ tavya is examined for a condition by statement 2.3.71, which is a part of the rule having the origin 4.1.2, in the inflection of the nominal stem expressing the agent Devadatta, (4) possibly 1.4.13 applies to call kṛ a base (aṅga) and control is passed to the base set 6.4.1-7.4.97 which outputs kartavya, and (5) 1.2.46 assigns the name nominal stem to kartavya (or kṛÑ tavya) because it ends in a primary affix (kṛt), i.e., the string tavya. This selection of rule origins all within the set 3.1.1-5.4.160, except for the possible passing of control to the base set 6.4.1-7.4.97, may be an indication of a general traffic rule.

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3.1.96 of (151.166) and 3.4.70 of (155.168)) and therefore the nominal stem kaṭa "mat" receives the nominative case according to 2.3.46 rather than the accusative according to H2.3.1 "when not placed" and 2.3.2 "when object - the accusative."

(160.172) Because the nominal stem kaṭa "mat" is the referent of the nominal stem kṛÑ tavya according to 3.4.70 "if kṛtya affixes . . . - object (karman$_7$) or bhāva" with H3.1.92 "that which is referred to by the term in the seventh (locative) case [i.e., the term object in 3.4.70] is upapada," the selection of the case of kṛÑ tavya depends on the case selected for kaṭa "mat." Because only the gender and number of the sense of the nominal stem kaṭa is to be designated, it and, consequently, kṛÑ tavya receive the nominative case according to 2.3.46.

Possibility (159.171) may account for the inflection of kaṭa with the nominative case but it does not account for the inflection of the nominal stem kṛÑ tavya. On the other hand, (160.172) accounts for the inflection of both the nominal stem kaṭa "mat" and the nominal stem kṛÑ tavya; for the number and case of kṛÑ tavya depend on that of kaṭa.[1] Thus, according to

[1]It is presumed that gender can be accounted for. Statement 2.3.46 "when there is to be designated nothing

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(160.172) the fact that kaṭa is the object (which is specified as a referent of the verbal element) in the given activity is not a factor in the selection of the case of kaṭa "mat" in either devadatta$_{instr}$ kaṭa$_{nom}$ kartavya$_{nom}$ or devadatta$_{gen}$ kaṭa$_{nom}$ kartavya$_{nom}$ "Devadatta ought to make the mat."

There is also the following evidence supporting (160.172). Whereas that which is recognized by the term inflected with the seventh (locative) case in a statement in the 3.1.91-3.4.112 set is the referent according to a strict interpretation of H3.1.92, a term inflected with the seventh case-ending (locative) specifying a condition in one of the statements 3.1.5-90 and 2.3.1-73 indicates that the string placed under that condition expresses that condition or concept. For example, the term karman$_7$ "when object" in 3.4.70 of (155.168) indicates that that which is analyzed as the object of the activity is the referent of the string kṛÑ tavya; but the term kartṛ$_7$ "when agent" in 3.1.79 of (118.133) or in 2.3.18 or 2.3.71 of the rule applied to output (158.170) indicates that the strings u, Ṭā or Ñas respectively of kṛ u ti, devadatta Ṭā or devadatta Ñas express the agent.

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but the gender and the number of the sense of the nominal stem (prātipadika) - the nominative (first)" itself implies this. Whether the grammar explicitly specifies or only implies by convention the gender of the referent of the participle for that participle is not determined in this study.

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Before considering other evidence supporting (160.172), let us consider another generation expressing the activity of Devadatta making a mat. As usual, control is passed to the verbal root set 3.1.91-3.4.112 according to the set selection convention on the basis of the element kṛÑ being called a verbal root. The origin of the rule selected this time is 3.2.102. The pertinent components of this rule and the output are the following.[1]

(161.174) 1.1.26 "niṣṭhā is Kta or KtavatU"

H3.1.1 "affix (pratyaya)"

H3.1.91 "after a verbal root"
H3.1.93 "primary affix (kṛt) is that which is not a tiÑ"

H3.2.84 "when that which was becoming"
3.2.102 "niṣṭhā"

(162.174)

verbal root	primary affix, niṣṭhā
kṛÑ	Kta [durative past]

Statement 3.3.171, applied in the previous generation by (153.167), is not applied to Kta in (162.174) above because Kta is not a member of the kṛtya subset of affixes. The origin of the next rule selected is 3.4.70.

Statement 3.4.70 is within a set of statements composed of 3.4.67-76. This set concerns itself with

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[1]Durative past is used to indicate the signification of bhūte "when that which was becoming."

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reference. The first statement, 3.4.67 "when agent (karman$_7$) - primary affix (kṛt)," specifies a general (utsarga) statement; whereas statements 3.4.68-76 are apavāda statements, i.e., statements which apply in specific domains of the general statement 3.4.67. The general statement 3.4.67 specifies that a primary affix (kṛt) indicates that an agent is referred to. As usual, the apavāda statements follow the utsarga statement.[1] The apavāda statement 3.4.70 is the origin of the rule applied to indicate the reference of the string kṛÑ Kta. The components of this rule and the transformed string are respectively expressed in the following.

(163.175) Analysis of the karaka set:
object : 1.4.49 : "mat (kata)"
agent : 1.4.54 : "Devadatta"

H3.1.1	"affix"
H3.1.91	"after a verbal root"
H3.1.92	"here, that which is referred to by the term in the seventh (locative) case is upapada"
3.4.70	"when object (karman$_7$) or bhāva - kṛtya affixes, Kta and those that have sense of KHaL [i.e., if kṛtya affix, then object or bhāva]"

[1]This analysis considers the Ls specified by 3.4.69 as a primary affix (kṛt). The replacement of LAṬ, for instance, by a tiÑ necessitates a convention whereby the (38.57) 1.1.56 "except in an operation on a sound, the substituens is like the substituendum" does not hold to specify that the tiÑ substituens has the characteristic primary affix (kṛt); for the definition of primary affix given by H3.1.93 is that it is not a tiÑ. We note that kṛt and tiÑ are names of mutually exclusive sets of elements and that LAṬ contains no phonological elements as the tiÑ affixes do.

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	verbal root	affix, primary affix, niṣṭhā
(164.176)	kṛÑ	Kta [durative past] (object)

In accordance with (C6.162) (d) (2) the rule having its origin at 3.4.114 is applied to assign the name ārdhadhātuka to the affix Kta. In the outputs of the following rules applied to the respective strings in the generation involving the activity of Devadatta making the mat, all three strings are shown.

(165.176) 1.2.45 "that which has signification, not a verbal root, not an affix is a nominal stem"

	nominal stem		verbal root	ārdhadhātuka, primary affix, niṣṭhā
(166.176)	devadatta	kaṭa	kṛÑ	Kta [durative past] (object)

(167.176) Analysis by the kāraka set:
object : 1.4.49 : "mat (kaṭa)"
agent : 1.4.54 : "Devadatta"

1.4.22, 1.4.103 specifying first element of each triplet of 4.1.2 when singularity.

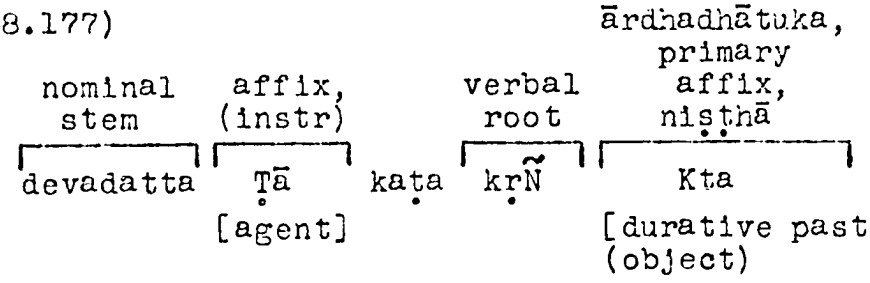
H2.3.1 "when not placed"
2.3.18 "when agent or helper - the third (instrumental) [triplet]"

H3.1.1 "affix"
H3.1.2 "and follows"

H4.1.1 "after ÑīP or nominal stem"
4.1.2 "sU au Jas am auṬ Śas Ṭā bhyām bhis . . . suP"

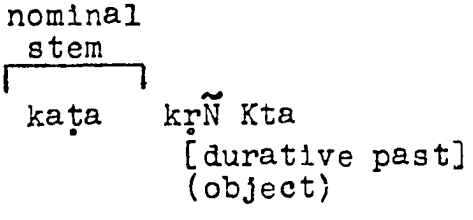
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(168.177)



Corresponding to the selection of the case for the nominal stem kṛÑ tavya (kartavya) depending on the case selected for its referent, kaṭa "mat," in the previous generation as indicated by (160.172), the selection of the case for the nominal stem kṛÑ Kta depends on the case selected for its referent, kaṭa. Thus, after kaṭa and kṛÑ Kta are assigned the name nominal stem by 1.2.45 and 1.2.46 respectively, control is passed to the 4.1.1-5.4.160 set where these nominal stems are inflected with the nominative case because only the gender and number of the sense of the nominal stem kaṭa is to be designated.

(169.177) 1.2.45 "that which has signification, not a verbal root, not an affix is a nominal stem (prātipadika)"



(171.177) 1.4.22, 1.4.103 specifying first element of each triplet of 4.1.2 when singularity.

H2.3.1 "when not placed"
2.3.46 "when there is to be designated nothing but the gender and the

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number of the sense of the nominal stem - the first (nominative) case"

H3.1.1 "affix"
H3.1.2 "and follows"

H4.1.1 "after Ñi, āP or nominal stem"
4.1.2 "sU au Jas . . . suP"

(172.178)

	nominal stem	affix, (nom)		affix, kṛt
devadatta$_{instr}$ [agent]	kaṭa	sU	kṛÑ [durative past] (object)	Kta

Because the selection of the case for that which has something as a referent depends on the case of that referent, kṛÑ Kta, after it is called a nominal stem by 1.2.46, receives the same case as kaṭa "mat," its referent, by the same rule.

(173.178) 1.2.46 "that which has signification, having a primary affix (kṛt), . . . is nominal stem"

(174.178)

		nominal stem
devadatta$_{instr}$ [agent]	kaṭa	kṛÑ Kta [durative past] (object)

(175.178) In accordance with (160.172), the affix selected by (171.177) for the referent kaṭa of kṛÑ Kta.

(176.178)

		nominal stem	affix, (nom)
devadatta$_{instr}$ [agent]	kaṭa$_{nom}$	kṛÑ Kta [durative past] (object)	sU

Let us now consider another generation involving

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the verbal root kṛ "do, make," Devadatta and the mat. As in the preceding generation, the origin of the first rule selected in the generation of the verbal element is 3.2.102, shown in (161.174). Whereas the affix selected in the previous generation at (161.174) was Kta, let us now select the affix KtavatU. The only condition within this rule is that there is the durative past. Thus, within the rule expressed again below, there is optional selection of the affix Kta or the affix KtavatU.

(177.179) 1.1.26 "niṣṭhā is Kta or KtavatU"

H3.1.1 "affix"

H3.1.91 "after a verbal root"
H3.1.93 "primary affix (kṛt) is that which is not a tiÑ"

H3.2.84 "when that which was becoming"
3.2.102 "niṣṭhā"

affix,
verbal root | primary affix, niṣṭhā

(178.179) kṛÑ | KtavatU [durative past]

The origin of the next rule selected is 3.4.67. As mentioned above (p. 175), this is a general (utsarga) statement, specifying that the set of primary affixes (the set kṛt), of which KtavatU is a member, denotes the agent. Whereas both the affix tavya, chosen in the first generation, and the affix Kta, chosen in the previous generation, satisfied the apavāda statement

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3.4.70 "when object (karman$_7$) or bhāva - kṛtya affixes, Kta and those that have sense of KHaL" (cf. (155.168) and (163.175)), none of the apavāda statements (i. e., those applying in a specific domain of the general statement) apply to our selected affix KtavatU. Thus, given the interpretation that every verbal root has an agent (kartṛ) associated with it, the general statement 3.4.67 holds.

(179.180) Analysis by the kāraka set:
object : 1.4.49 : "mat (kaṭa)"
agent : 1.4.54 : "Devadatta"

H3.1.1 "affix"

H3.1.91 "after a verbal root"
H3.1.92 "here, that which is referred to by the term in the seventh (locative) case is upapada"

3.4.67 (kartṛ$_7$ kṛt$_1$) "when agent (kartṛ) - a primary affix [i.e., if primary affix, then it denotes the agent]"

	verbal root	affix, primary affix, niṣṭhā
(180.180)	kṛÑ	KtavatU
		[durative past] (agent)

In accordance with convention (C6.162) (d) (2) the rule having the origin 3.4.114 assigns the name ārdhadhātuka to the affix KtavatU.

In the preceding two generations the affix after the string devadatta is placed in the expression of the agency of that string (cf. (158.170) and (168.177)); the agent was not denoted by the affix tavya or the

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affix Kta. Instead, the object was denoted by the affix placed after the verbal root. In this generation the affix placed after kaṭa "mat" expresses the fact that the kāraka set 1.4.23-55 analyzes the "mat (kaṭa)" as the object; the object is not denoted by the affix KtavatU of the verbal string kr̃N KtavatU. The agent is denoted by the affix KtavatU. Thus, if the primary affix (kṛt) placed after the verbal root denotes either the agent or the object, the lexical representation of that object or agent which is not denoted by the affix placed after the verbal root is inflected with a case-ending to express that object or agent. The accusative case is selected to express the object according to 2.3.2 "when object - the accusative." The status of the strings is now the following.

(181.181)

	nominal stem	affix, (acc)	verbal root	affix, primary affix, niṣṭhā
devadatta	kaṭa	am [object]	kr̃N	KtavatU [durative past] (agent)

Now that the non-referents of the primary affix (kṛt) KtavatU have the nominative case-ending, the strings devadatta and kr̃N KtavatU are assigned the name nominal stem according to 1.2.45 and 1.2.46 respectively. Because there is nothing to be expressed but the gender and number of the sense of the nominal stem devadatta, the nominative case-ending is placed after the lexical representation of Devadatta. The

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string krÑ KtavatU receives the same case-ending as its referent, devadatta. This is analogous to (173.178) - (176.178).

(182.182) devadatta$_{nom}$ kaṭa$_{acc}$ [object] krÑ KtavatU$_{nom}$ [durative past] (agent)

In the Western tradition, the kṛta- (< krÑ Kta) of devadattena kaṭaḥ kṛtaḥ (< (176.178)) "the mat was being made by Devadatta" has been called a past passive participle and kṛtavat- (< krÑ KtavatU) of devadattaḥ kaṭam kṛtavat (< (182.182)) "Devadatta was making the mat" has been called a past active participle. In Pāṇini's grammar the verbal element kṛta in the first example refers to an object while the verbal element in the second example refers to the agent.

Let us consider a generation involving the combination of the verbal root ÀsA "sit," devadatta and kaṭa "mat." As in the preceding generations, the origin of the first rule selected concerning the verbal element is within the verbal root set 3.1.91-3.4.112. This time let us choose 3.2.123 "when occurring (i.e., present) - LAṬ" as was done in (110.128) for the verbal root krÑ.

This is followed by the application of the rule having the origin 3.4.69 "the Ls - when agent (kartṛ) and object (karman) or when agent and bhāva after that which does not have an object."[1]

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[1] Cf. supra, footnote 1, p. 128 for discussion of the Ls.

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verbal root | affix

(183.183) ā̀sA | LAṬ
[present]
(agent)
(bhāva)

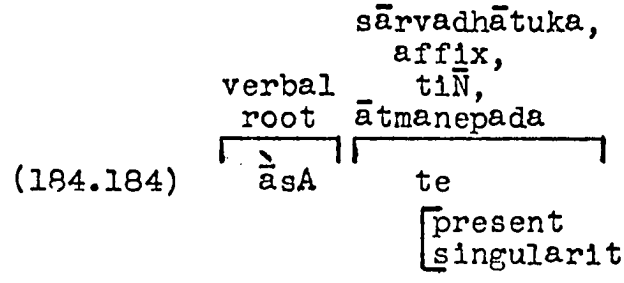
This specifies that the L denotes both agent and bhāva. This rule cannot specify that the L denotes both agent and object because the kāraka set 1.4.23-55 analyzes "Devadatta" as the agent and "mat (kaṭa)" as the location (adhikaraṇa) according to 1.4.45 "the receptacle (sphere) is location (adhikaraṇa)." The statement 3.4.69 is additional evidence that every verbal root has an agent associated with it. This study assumes that the term bhāva in some sense signifies focusing on the concept of the verbal element itself.

The third person singular ātmanepada affix ta replaces the LA of LAṬ by the rule having the origin 3.4.78. The structure of this rule is presented in (123.139). Statement 1.3.12 "after that which has low pitch or an ñ as it - the ātmanepada" instead of 1.3.13 specifies the ātmanepada set of endings because the verbal root ā̀sA has low pitch.[1] The rule having the origin 3.4.79 and expressed at (126.141) replaces the a of ta by e. Statement 3.4.113 names the affix te a sārvadhātuka because it is a member of the tiÑ set. The final output of the verbal root set 3.1.91-3.4.112 is the following.

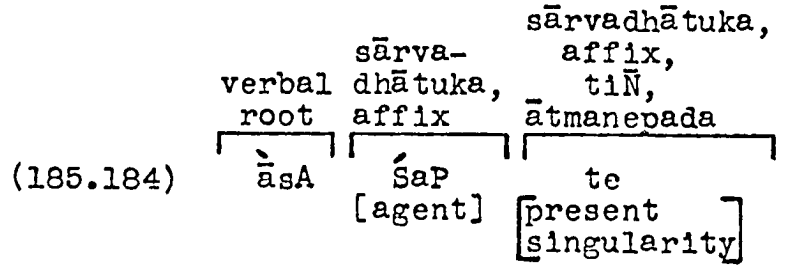
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[1]This study assumes without justification that the low pitch is on the ā rather than on the A.

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According to (C6.162) (c) the set 3.1.33-90 examines this output and the affix śaP is placed after the verbal root by the rule having the origin 3.1.68 "when agent (kartṛ), before a sārvadhātuka - śaP." According to (C6.162) (d) (2), the affix śaP is assigned the name sārvadhātuka. The following is the final output of the set 3.1.5-3.4.117.



Because the agent is expressed by śaP of the verbal string and there is nothing to be expressed but the gender and number of the sense of the nominal stem, the lexical representation of the agent is inflected with the nominative case-ending according to 2.3.46. After kaṭa, the lexical representation of the "mat," which is analyzed as the location (adhikaraṇa) by the kāraka set, is assigned the name nominal stem by 1.2.45, the locative case-ending is placed to express the location according to 2.3.36 "the locative (seventh) . . . when location (adhikaraṇa)." The analysis by the kāraka

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set and the final formatives[1] are the following.

(186.185) Analysis by the kāraka set:
location (adhikaraṇa) : 1.4.45 : "mat (kaṭa)"
agent (kartṛ) : 1.4.54 : "Devadatta"

(187.185) devadatta$_{nom}$ ȁsA ŚaP te kaṭa$_{loc.}$
[agent] [location]

Let us now return our attention to the string (182.182), given again below as (189.185), in which the primary affix (kṛt) KtavatU denoted the agent. The following is the analysis by the kāraka set.

(188.185) Analysis by the kāraka set:
object : 1.4.49 : "mat (kaṭa)"
agent : 1.4.54 : "Devadatta"

(189.185)

devadatta$_{nom}$ kaṭa$_{acc}$ kṛÑ KtavatU$_{nom}$
[object] [durative past]
(agent)

The lexical representation of the agent was inflected with the nominative case-ending according to 2.3.46 because there was nothing to be expressed but the gender and number of the sense of the nominal stem. The primary affix KtavatU was inflected with the same case-ending

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[1] Statement 2.4.72 "after adI etc. [verbal roots of the so-called second class, of which ȁsA is a member] in the place ŚaP - LUK" elides the ŚaP. Whether this occurs after all affixes of the set 3.1.1-5.4.160 are placed (i.e., after control is completely passed from the set 3.1.1-5.4.160) or after all affixes of the set 3.1.1-3.4.117 are placed after the verbal root is a problem for further study. Since (44.59) is concerned with a base, it appears that this specification of the characteristics of the replacement of ŚaP by LUK does not apply in the inflection of devadatta.

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as that of the string devadatta, the lexical referent of KtavatU.

Accordingly, because the lexical element devadatta is both in (187.185) "Devadatta sits on the mat" and in (189.185) "Devadatta was making the mat" and according to the kāraka set's respective analyses of each activity they both (1) have the same referent, "Devadatta," and (2) have the same kāraka term (agent) assigned to represent that referent, we may form the string of formatives (190.186) with the signification "Devadatta, who was making the mat, sits on the mat." We note that whether or not the kāraka set analyzed the same mat or two different mats in the two activities does not appear to be relevant.

(190.186) $kaṭa_{acc}$ $kṛÑ$ $KtavatU_{nom}$ $devadatta_{nom}$
[object] [durative past] (agent)

$ÀsA$ $ŚaP$ te $kaṭa_{loc}$
[agent] [location]

Let us now consider the generation of another activity in which, instead of Devadatta sitting on the mat, we have Yajñadatta sitting on the mat. The analysis by the kāraka set is given in (191.186) below. The string of generated formatives representing this activity follows.

(191.186) Analysis by the kāraka set:
location (adhikaraṇa) : 1.4.45 : "mat (kaṭa)"
agent (kartṛ) : 1.4.54 : "Yajñadatta"

(192.186) $yajñadatta_{nom}$ $ÀsA$ $ŚaP$ te $kaṭa_{loc}$
[agent] [location]

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Considering again (176.178), given again below as (194.187) which contains the formatives representing devadattena kaṭaḥ kṛtaḥ "the mat was being made by Devadatta," we observe that kaṭa has the nominative case-ending placed after it because there is nothing to be expressed but the gender and number of the sense of the nominal stem. The nominal stem kṛÑ Kta receives the same case-ending as the lexical representation of its string referent, the mat. The following represents the analysis by the kāraka set.

(193.187) Analysis by the kāraka set:
object : 1.4.49 : "mat (kaṭa)"
agent : 1.4.54 : "Devadatta"

(194.187) devadatta$_{instr}$ kaṭa$_{nom}$ kṛÑ Kta$_{nom}$
[agent] [durative past]
(object)

The kaṭa in (192.186), "Yajñadatta sits on the mat," has the locative (seventh) case-ending placed after it to express location (adhikaraṇa). Thus we have the same referent, the mat, in both (191.186) and (193.187). However, as may be seen in (195.188) below, this referent has a different function (role) in the respective activities; for whereas in (191.186) it is analyzed as the location (adhikaraṇa) because it satisfies the concept "the receptacle (sphere)" specified by 1.4.45, in (193.187) it is analyzed as the object (karman) according to 1.4.49 "that which is most wished to be obtained by the agent" in the activity.

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(195.188)
location (adhikaraṇa) : 1.4.45 :
object (karman) : 1.4.49 : > "mat (kaṭa)"

According to 2.3.36 "the locative case-ending (seventh) . . . when the location (adhikaraṇa)," kaṭa "mat" has the locative in (192.186) "Yajñadatta sits on the mat" because there is more (i.e., the location (adhikaraṇa)) to be expressed than just the gender and number of the sense of the nominal stem. Parallel to (160.172), the declensional affix (sUP) selected for the nominal stem kṛÑ Kta in (194.187) is the same as the one selected for that (i.e., the object kaṭa) which is denoted by kṛÑ Kta. Because the entity denoted by kṛÑ Kta in (194.187) is the same as the one which is lexically represented in (192.186), where the locative singular case-ending is placed after kaṭa "mat" to express the location (adhikaraṇa) in addition to merely the gender and number of the sense of the nominal stem as it is in (194.187); the two strings (192.186) and (196.189) may be combined as in (197.189), which are the formatives representing "Yajñadatta sits on the mat, which was being made by Devadatta." As in (194.187), the declensional affix selected for kṛÑ Kta is the same as the one which is selected for the lexical representation of that which is denoted (i.e., kaṭa "mat") by the string kṛÑ Kta.

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(196.189) devadatta$_{\text{instr}}$ kr̃Ñ Kta
[agent] [durative past]
(object)

(197.189) devadatta$_{\text{instr}}$ kr̃Ñ Kta kaṭa$_{\text{loc}}$
[agent] [durative past] [location]
(object)

yajñadatta$_{\text{nom}}$ ā̀sA śaP te
[agent]

As may be seen in (198.190) below, in (186.185) and (188.185) the kāraka set assigned the same term, agent, to the same entity, "Devadatta," in the two respective activities; whereas in (191.186) and (193.187) the kāraka set assigned different terms, location and object, to the same entity, "mat (kaṭa)," in the two respective activities. In analysis 188 (see (198.190)) the entity denoted by the primary affix (kṛt) KtavatU of the "participle" has a lexical representation, devadatta, which does not express that entity's function as specified by the kāraka set's analysis (186.185). In analysis 193 (see (198.190)) the entity, "mat (kaṭa)," denoted by the primary affix Kta of the "participle" also has a lexical representation; but that lexical representation does express the function of that entity as specified by the kāraka set's analysis (191.186). Thus, it is not an argument in the combination of the two strings of formatives given in (190.186) and (197.189) whether or not the lexical representation of the entity denoted by the primary affix of what later is assigned the name nominal stem (the "participle") expresses the

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function of that entity in the other activity.

(198.190)

	Kāraka term (function)	Lexical representation	Kāraka term expressed by	"Participle"
186	location	kaṭa	$kaṭa_{loc}$	
186	agent	devadatta	ŚaP	$KtavatU_{nom}$ (agent)
188	agent	devadatta		
188	object	kaṭa	$kaṭa_{acc}$	
191	agent	yajñadatta	ŚaP	
191	location	kaṭa	$kaṭa_{loc}$	Kta_{loc} (object)
193	object	kaṭa		
193	agent	devadatta	$devadatta_{instr}$	

Let us now consider the combination of the generated formatives representing the activities respectively analyzed by the kāraka set as in (191.186) and (188.185). These strings of generated formatives, (192.186) and (189.185), representing these activities are presented again below. In (199.191) yajñadatta is the lexical representation of the agent, which is expressed by the ŚaP of ÀsA ŚaP te, and kaṭa both expresses and is the lexical representation of the location (adhikaraṇa). In (200.191) kaṭa expresses and is the lexical representation of the object, devadatta is the lexical representation of the agent, and the KtavatU of kṛÑ KtavatU denotes the agent of that activity.[1] Because

[1]The nominal stems yajñadatta in (199.191),

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the denoted agent "Devadatta" is not lexically represented by a nominal stem in (199.191) the two strings connot be combined.

(199.191) yajñadatta ā̀sA śaP te kaṭa$_{loc}$
[agent] [location]

(200.191) devadatta kaṭa$_{acc}$ kṛÑ KtavatU
[object] [durative past] (agent)

In the preceding discussion there has been a distinction between (1) the lexical representation of an entity, (2) the expression of a kāraka function of an entity and (3) the denotation of (or reference to) an entity. Both the entity expressed and the entity denote are signalled in the statements of the grammar by a term inflected with the seventh (locative) case-ending. The expression of the kāraka function of an entity is specified by statements 2.3.1-73 and 3.1.5-90, while reference to an entity on the basis of its kāraka function is specified by statements in the verbal root set 3.1.91-3.4.112.

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devadatta and kṛÑ KtavatU in (200.191) do not have declensional affixes (sUPs) after them because the placement of these sUPs occurs after the potential operation under consideration, i.e., the combination of the two strings (199.191) and (200.191). The sequence of operations under consideration is: (1) the identity of the referent of kṛÑ KtavatU in (200.191) with a nominal stem in (199.191), (2) the placement of the declensional affix after that nominal stem in (199.191) and (3) (which will not occur in our instance because (1) fails) the placement of that same declensional affix after kṛÑ KtavatU in (200.191).

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While in the preceding examples of generated formatives of activities, the entity denoted by the primary affix (kṛt) of the string which becomes a nominal stem ("participle") was always lexically represented; the question arises whether the grammar demands that that denoted entity must be lexically represented. There occurs in Sanskrit such a simple verb as āste "he sits" (< ÀsA ŚaP te with the agent expressed by the ŚaP and neither lexically represented nor denoted). Also, such a nominal stem as kāraka "doer" (< kṛÑ ṆvuL) denotes, according to 3.4.67 of (90.115), the agent of the verbal root kṛÑ but neither lexically represents nor expresses the agent. One might consider that once the string kṛÑ ṆvuL becomes named a nominal stem it may stand for its referent, the entity involved in the act of doing. If the referent were lexically represented (i.e., named; e.g. devadatta-), the case-ending would be the same as that placed after devadatta-. However, we note that in the analysis presented in this study the agreement in gender of participles such as kṛta- (< kṛÑ Kta) with the lexical representation of its referent is not accounted for.

The hypothesis that the lexical representation of the entity denoted by the primary affix (kṛt) is not obligatory leads to the following consideration. Instead of (197.189), which are the formatives representing

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"Yajñadatta sits on a mat which was being made by Devadatta," (201.193) below might occur, where the Kta of kṛÑ Kta denotes a mat which is not lexically represented and the formatives represent "Yajñadatta sits on that which was being made by Devadatta."

(201.193)

devadatta$_{instr}$ [agent]	kṛÑ Kta$_{loc}$ [durative past] (object)
yajñadatta$_{nom}$	ā̀sA śaP te [agent]

Because there are such forms as āste (< ā̀sA śaP te) "he sits" with the agent not lexically represented, it would be possible to not have the agent Yajñadatta lexically represented in (201.193) above. It is probable, however, that the lexical representation of the agent Devadatta could not be omitted in (201.193). It should be emphasized that these considerations need further analysis and that they result from our interpretation of the formal characteristics of the grammar.

The Kāraka Set 1.4.23-55

Statements 1.4.24-55, headed by statement 1.4.23 "when there is that which is doing," analyzes the participants in the activity associated with a verbal root. The output of the kāraka set is one or more terms which have referents recognized by the conditions (concepts) in the definientia of statements 1.4.24-55.

The following seven statements have been considered basic definitions within the kāraka set. They

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are fundamental in the sense that (1) no particular verbal roots or senses are specified in their definientia and (2) the same term, aside from agent in 1.4.54 and 1.4.55, is not specified in any two definienda.

(202.194) 1.4.24 "the fixed thing when there is removal is apādāna"

This definition specifies that that which satisfies the condition "the fixed thing when there is removal" is called apādāna. Alternatively, the term apādāna refers to that thing, the existence of which is based on the concept "the fixed thing when there is removal." Because the signification of H1.4.23 "when there is that which is doing (or making)" holds in this statement, the entity under consideration is involved in an activity.

Examples of things called apādāna are the village and the chariot respectively in grāmād āgacchati "he comes from the village" and rathāt patitaḥ "fallen from the chariot." Both grāmād and rathāt are inflected with the ablative case-ending according to 2.3.28 "when apādāna - the fifth" which is a part of the rule having the origin 4.1.2 (sUP).[1]

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[1]The terms apādāna, recipient, helper, location, object, agent and cause which are the potential output of the kāraka set are the conditions or parts of conditions in the statements of the 2.3.1-73 set which specifies the particular case-ending triplet. The structure of the rules placing these case-endings is the same as that of (73.99).

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(203.195) 1.4.32 "that which one approaches by means of an object is recipient (sampradāna)"

This statement specifies that the term recipient refers to that, the existence of which is based on the concept "that which one approaches by means of an object." An example of something referred to by the term recipient is the teacher in upādhyāyāya gāṃ dadāti "he gives the cow to the teacher." Upādhyāyāya is inflected with the dative case-ending according to 2.2.13 "the dative - when recipient."

(204.195) 1.4.42 "that which is most effective is helper (karaṇa)"

This statement specifies that the term helper refers to that which is most effective in the activity. An example of something referred to by the term helper is the sickle in dātrena lunāti "he cuts with the sickle."

(205.195) 1.4.45 "the receptacle is location (adhikaraṇa)"

This statement specifies that the term location refers to that which is the receptacle or sphere of the activity. Examples of things referred to by the term location (adhikaraṇa) are the mat and the pot in the following: kaṭe āste "he sits on the mat," kaṭe śete "he sleeps on the mat," and sthālyāṃ pacati "he cooks in a pot."

(206.195) 1.4.49 "that which is most wished to be obtained by the agent is object (karman)"

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This statement specifies that the term object refers to that which is most wished to be obtained by the agent in the activity. Examples of things referred to by the term object (karman) are the mat, the village and the rice in the following: kaṭaṃ karoti "he makes a mat," grāmaṃ gacchati "he goes to the village" and payasaudanaṃ bhuṃkte "he eats rice with milk."

(207.196) 1.4.54 "the independent one is agent (kartṛ)"

The term agent refers to the independent one in the activity. An example of something satisfying the concept "the independent one in the activity" is Devadatta in devadattaḥ pacati "Devadatta cooks."

(208.196) 1.4.55 "the instigator of that is cause (hetu) as well as agent (kartṛ)"

This statement specifies that the term cause (hetu) instigates the agent of the activity and is agent of the new (causative) activity. This statement has been analyzed in the discussion of (140.152) - (150.158).

The definientia of other statements in the kāraka set 1.4.23-55 specify particular conditions. Some of these are particular verbal roots such as statement 1.4.25 "the cause for fear of the senses of the verbal roots bhī ["fear"] and trā ["protect"]." In the examples caurebhyo bibheti and caurebhya udvijate, both meaning "he is afraid of thieves" the verbal root bhī and the verbal root vij with the preverb ud satisfy

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the condition "the senses of the verbal root bhī ["fear"]."

Certain statements specify a particular verbal root and preverb. An example is statement 1.4.46 "the receptacle (sphere) of the verbal roots sthā ["exist, stand"], śīṄ ["lie, rest"] or ās ["exist, sit"] with the preverb adhi ["over, upon"] is object (karman)." The basis for this sūtra is that (a) the verbal roots sthā, śīṄ and ās have only the concepts "agent" and "bhāva" but not the concept "object" inherent in them and (b) the preverb adhi modifies the sense of the root by changing the concepts to "agent" and "object." The receptacle (sphere) of the activity expressed by one of these three verbal roots with the preverb adhi specifies the existence of the term object (karman).

Thus, the meaning of pātālam adhitiṣṭhati is "she inhabits (dwells in) the netherworld"; the passive tayā pātālam adhiṣṭhīyate "the netherworld is inhabited by her" can be formed by the placement of the affix yaK to express the object according to statement 3.1.67 of (130.143) and the placement of the nominative case-ending after pātāla- "netherworld" according to 2.3.46 "when there is to be designated nothing but the gender and the number of the sense of the nominal stem - the nominative." Without statement 1.4.46 an entity such as the "netherworld" would satisfy 1.4.45 "the receptacle (sphere) is location (adhikaraṇa)." Its lexical representation would be inflected with the locative

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case-ending according to 2.3.36 "the locative (seventh) case-ending . . . when location (adhikaraṇa)"; the passive construction could not be formed, for 3.1.67 requires the existence of the term object (karman).

Certain other statements specify a particular feature of an entity involved in the activity. For example, in statement 1.4.26 "the unendurable of parā ji is apādāna" it is specified that the entity involved in the activity must be unendurable. That is, apādāna is specified as that thing, expressed with the verbal root ji "conquer, overcome" with the preverb parā, which is unbearable because one is not capable of mastering it. For example, in the utterance adhyayanāt parājayate "he finds studying unbearable" or "he is overcome by studying" "studying" is the entity involved in the activity associated with the verbal root ji with the preverb parā. In contrast, in śatrūn parājayate "he defeats the enemies" śatrūn "enemies" is not that which is unendurable and therefore statement 1.4.26 is not satisfied. However, the "enemies" does satisfy statement 1.4.49 "that which is most wished to be obtained by the agent is object (karman)" and, according to statement 2.3.2 of (73.99) the nominal stem which is the lexical representation of the "enemies" is inflected with the accusative case-ending. Thus, while the verb form is identical, the contrast in the activities is manifested in the different surface case-endings of adhyayanāt "from studying," which is in the ablative

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(fifth) case according to 2.3.28 "when apādāna - the fifth," and of śatrūn "enemies," which is in the accusative (second) case according to 2.3.2 "when object (karman) - the accusative (second)." It appears that without statement 1.4.26 the grammar would be unable to generate adhyayanāt parājayate "he is overcome by studying."

Statement 1.4.30, "the material cause of the agent of the verbal root jan ["be born, be produced, come into existence"] is apādāna," specifies that the elementary matter which is the material cause of that which becomes the agent of the birth or production is called apādāna. For example, in śṛṅgāccharo jāyate "the arrow is produced from the horn," the horn of an animal, śṛṅga, is the elementary matter from which the arrow, śara, is produced or originates. The "arrow" satisfies statement 1.4.54, "the independent one is the agent (kartṛ)."

Statement 1.4.31, "the source (origin, cause of existence) of the verbal root bhū ["become"] is apādāna," is satisfied by the "Himalayas" in himavato gaṅgā prabhavati "the Ganges originates from (arises in) the Himalayas." In contrast to statement 1.4.30, where there is a process from material cause to agent (i.e., the elementary matter is modified into the agent), there is none in this statement, where the source, e.g., the "Himalayas," does not necessarily have the same nature

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as the agent, e.g., the "Ganges." The one is a group of mountains; the other, a river.[1]

Thus, certain statements in the kāraka set contain particular verbal roots or a particular feature of an entity as conditions. That the entities associated with particular verbal roots are arguments in the verbal activity is evidenced in such statements as 1.4.30 "the material cause of the agent of the verbal root jan ["be born, be produced, come into existence"] is apādāna" and 1.4.31 "the source (origin, cause of existence) of the verbal root bhū ["become"] is apādāna."

The specification of the term yielded to represent the entity involved in the activity is a function of (1) the statement(s) satisfied in the kāraka set, and (2) if more than one statement in the kāraka set is satisfied, (a) the relative positions of those statements and (b) the signification of the heading statements of the larger set (1.4.1-2.2.38) of which the kāraka set is a member: Hl.4.1 "as far as 2.2.38 - one term" and Hl.4.2 "when there is conflict the last is to be done." Thus, if more than one statement in statements 1.4.24-55 is satisfied for one entity in an activity, then, according to Hl.4.1-2, only the term

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[1]The lexical representations of the entities analyzed as apādāna by statements 1.4.25, 1.4.26, 1.4.30 and 1.4.31 are inflected with the ablative case-ending according to 2.3.28 "when apādāna - the ablative (fifth)."

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specified by the last statement is yielded as the symbol having that participant as its referent.[1]

For example, in asiś chinatti "the sword cuts" the sword satisfies both the condition that which is most effective of 1.4.42 and the condition the independent one of 1.4.54. Because, according to Hl.4.1, there can be only one term, there is conflict in that 1.4.42 specifies the term helper (karaṇa) and 1.4.54 specifies the term agent (kartṛ). This conflict is resolved by Hl.4.2 which specifies that the term in the last statement satisfied is to be done. Thus, the term agent is yielded to represent the existence of the sword. It should be noted that the operation of Hl.4.1-2 on the analysis of the kāraka set might be interpreted as indicating the inference that the sword is the most effective in the activity.

Another example of the heading statements 1.4.1-2 operating on the output of the kāraka set is evident in the analysis of sthālī pacati "the pot cooks," where the "pot (sthālī)" is analyzed both as location (adhikaraṇa) according to 1.4.45 "the receptacle (sphere) is location (adhikaraṇa)" and as agent according to 1.4.54 "the independent one is agent (kartṛ)." The heading statements 1.4.1-2 of the larger set operate

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[1]Alternatively, one could say that although a participant of an activity might have more than one "role," only one term is specified to represent the role of that participant in the activity.

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on the output of the kāraka set to specify the term agent as the symbol having the "pot (sthālī)" as its referent.

The analysis of dhanuṣā vidhyati "he pierces with the bow" also includes Hl.4.1-2 operating on the output of the kāraka set. The "bow (dhanu)" satisfies both 1.4.24 "the fixed thing when there is removal is apādāna" and 1.4.42 "that which is most effective is helper (karaṇa)." The two terms apādāna and karaṇa are yielded by the kāraka set and then Hl.4.1-2 operate to specify the term helper (karaṇa) as the symbol having the "bow (dhanu)" as its referent. The lexical representation of the bow, dhanu, is inflected with the instrumental (third) case-ending according to 2.3.18 "when agent (kartṛ) or helper (karaṇa) - the instrumental (third)."

With this brief presentation of the kāraka set we conclude this chapter. It is hoped that it has provided an adequate description of the role the kāraka terms play in the context of the grammar as a whole.

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CHAPTER IV

CONCLUSION

This study has presented certain basic formal characteristics of Pāṇini's grammar in order to impose some rigor on the analysis of the context of the kārakas. A distinction has been made between a sūtra without its anuvṛtti (one or more terms from one or more preceding sūtras being considered in force (present)) and a statement, which designates a sūtra with its anuvṛtti. The different kinds of statements of the Aṣṭādhyāyī have been characterized as specifying notation; being a list of elements; assigning names to strings; specifying the existence of a term; specifying a position, condition or name; specifying placements and specifying the characteristics of replacements.

The majority of statements in the grammar are arranged in sets which may contain subsets. A set of statements may or may not have heading statements, where a statement S is considered a heading statement on the basis of (1) the semantic feature of the existence of the complete signification of that statement S in all non-heading statements of that set and

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(2) the syntactic feature of its being either initial in the set in which its signification holds or immediately after another heading statement of that same set. The sets of statements considered in this study are the ātmanepada-parasmaipada set 1.3.12-93, the set 1.4.1-2.2.38, the kāraka set 1.4.23-55, the case-ending set 2.3.1-73, the base set 6.4.1-7.4.97, the affix set 3.1.1-5.4.160 and the verbal root set 3.1.91-3.4.112.

The structure of a rule has been described. The origin of a rule is the non-heading statement selected in accordance with traffic rules. The structure of the rule contains the following information. The case-endings of terms in the origin are interpreted and the origin (or the output of a set of statements such as the kāraka set) receives the signification of the heading statements of the sets of which it is a member. The terms in the origin are interpreted. The signification of a term may be specified by another statement, by a series of statements or by interrelated statements.

An initial description of the conventions ordering the applications of rules has been undertaken. It appears that a fairly accurate convention is that the assignment of the name N to a string (or substring) specifies that the potential origin of the next non-naming rule to be applied is contained within the set of statements having N as a term in its first heading statement. The control of the selection of origins of

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rules is then passed to that set. There appears to be an iteration convention; wherein if within a set of statements in control there is more than one rule origin, the statement number of each successive origin is greater than the statement number of the previous origin.

Because the kāraka terms are symbols for the various arguments in an activity involving a verbal root, the generation of formatives by rules having origins within 3.1.5-4.1.2 has been concentrated on. A description of the traffic conventions necessary to the discussion of these formatives has led to a consistent, systematic description of generations involving kāraka terms in finite verbs such as the "active" karoti and its "passive" counterpart kriyate.

The combination of the generations of formatives involving a causative verbal root has been described. The pattern of the combination of the generations of formatives for "active" and "passive" utterances has been observed to be the same whether the verbal root involved in the activity is a causative or non-causative one. There appears to be no method to construct a causative verb directly from the formatives which have been placed to represent the non-causative verb.

The formation of strings other than finite verbs has also been presented. In the generation of the formatives kr̥Ñ ṆvuL (> kāraka- "doer") a rule origin specifies that the primary affix (kr̥t) ṆvuL indicates

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that there is a referent which is the agent of the verbal root kṛÑ "do, make." In the generation of this form there is no string which is placed to express the agent.

In the generation of formatives, e.g., kṛÑ KtavatU, representing what we call a participle, a rule specifies that the primary affix (kṛt) KtavatU indicates that there is a referent which is the agent of the verbal root kṛÑ in the activity. As in the generation of kāraka-, the entity which is the agent in this activity may or may not be lexically represented. There appears to be a convention wherein if the referent is lexically represented the same case-ending selected for it is selected for the string denoting that entity. Thus, it is possible for the participle to be grammatically connected with the lexical representation of its referent which is an entity involved in the generation of formatives of another activity.

Thus, by means of a formal distinction between the denotation of, the lexical representation of and the grammatical expression of an entity which is an argument in the kāraka set's analysis of the verbal activity and by direct generation of Sanskrit forms without any intervening positional movement of elements, Pāṇini concerned himself with what we today call semantics and syntax.

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