CHAPTER ONE

1 INTRODUCTION AND SCOPE OF THE PRESENT WORK

1.1 CONSTRUCTION OF A SYSTEM FOR THE DERIVATION OF CORRECT FORMS

Pāṇini’s Astādhyāyī is not considered as a grammar for the purpose of teaching Sanskrit, but as a successful attempt at constructing a system of concise and consistent rules for the derivation of correct Sanskrit forms and sentences. It is from this standpoint that both Kātyāyana and Patañjali approach it. The thrust is on testing the necessity of given rules and their relationships to other rules. The modern linguist is interested in Pāṇini’s grammar only to the extent that he can perceive the method behind the specific construction of any rule and to understand why alternative constructions would not be acceptable.

The modern approach to Pāṇini should bring out the correspondence in contemporary linguistic theory and explain the factors which make Pāṇini’s work different. Such studies should reveal the extent to which the method of grammatical theory construction derived from Pāṇinian approach could be applied for the description of other Indo-European languages.
1.2 PURPOSE AND SCOPE OF THE PRESENT WORK

The purpose and scope of the present work is limited to studies in contemporary conceptual framework those aspects which might reveal Panini’s grammatical theory construction as reflected in the Astādhyāyī in general and regarding morphology and syntax in particular.

1.3 STEM-SUFFIX ANALYSIS IN PĀÑINI’S APPROACH

It was realised in the West that the analysis of speech into sentences, words and sounds as introduced by the Greeks and practised in Europe till the beginning of the 19th century was defective in that it ignored the abstract functional elements or morphemes of the words, taking the words, naively, to be natural, irreducible wholes. It was only the acquaintance with Panini’s method that was responsible for the rectification of that defect in the West, making it possible to dissect the nominal and verbal forms of other Indo-European languages also into their elements, namely, stems and suffixes each of which has its particular form and function and which unites into word-forms in accordance with strictly definable and regularly recurring processes.
1.4 *Aṣṭādhyāyī* as a Self-Contained Grammar

Pāṇini was concerned with perfecting the tradition of grammatical description to make it a self-contained science in itself without recourse to any extraneous definition or factor in other branches of knowledge.

1.5 *Aṣṭādhyāyī* as a Generative Grammar

Pāṇini’s perfection and ingenuity at theory construction have rarely been matched outside the realm of linguistics. In the West this corresponds to the belief that mathematics is the more perfect of the sciences. In the West the value of Pāṇini’s formulations could be recognised only when they were able to independently construct comparable systems. To Pāṇini, the grammar is not a body of learning resulting from linguistic analysis but a device which enables one to derive correct Sanskrit words. The machinery comprises rules and technical elements, its input being word elements, namely, stems and suffixes and its output being correct Sanskrit words, thus making *Aṣṭādhyāyī* a generative device in the literal sense of the word. Since its grammar is a system of rules which enables us to decide the correctness of the words derived and also as it provides words with a structural description it may be called a Generative Grammar.
1.6 **ASTADHYAYI AS A PARADIGM FOR THEORY CONSTRUCTION IN ANY BRANCH OF KNOWLEDGE**

Panini's grammar provides a complete characterisation of Sanskrit utterances by constructing a theory of description which enables one to generate and analyse all possible utterances. The approach to grammatical theory construction in *Astadhyayi* is so perfect that it also provides the paradigm example in the Indian tradition for theory construction in other \textit{s\=astras}.

**ASTADHYAYI AS PARADIGM EXAMPLE OF THEORY CONSTRUCTION IN INDIAN S\=ASTRAS**

1.7 **S\=ASTRAS OF P\=ANINI AND K\=AN\=ADA AS FOUNDATIONAL DISCIPLINES**

The Indian method of theory construction finds its paradigm example in the Sanskrit grammar of Panini, the *Astadhyayi*, just as the modern western systems of axiomatised formal theories find their paradigm example in the exposition of geometry in Euclid's 'Elements'.

The traditional Indian view is expressed in the maxim that the \textit{s\=astras} expounded by Kan\=ada and Panini are the bases of all other \textit{s\=astras}. The \textit{s\=astras} expounded by Kan\=ada refer to the corpus of Ny\=aya-Va\=ises\=ika schools, the physics and metaphysics being expounded in the Va\=ises\=ika school and the epistemology and logic being expounded by the Ny\=aya.
school. The śāstra of Pāṇini refers to the entire science of linguistics or sabda-śāstra. In the Indian view these two śāstras were the foundational disciplines for a serious pursuit of all other śāstras in order to have an in-depth understanding of the methodologies, theories and techniques developed in them.

And between these two śāstras, the grammar of Pāṇini is held in higher esteem.

1.8 ASTĀDHYĀYĪ AS MAJOR SOURCE OF IDEAS FOR MODERN LINGUISTICS

In the nineteenth century when the modern linguistics emerged as a discipline and in the twentieth century in the descriptivist, structuralist and generativist phases of its development the Astādhyāyī proved itself to be a major source of ideas and techniques for it. However, much of the basic methodology and technical intricacies of Pāṇini’s grammar could not be grasped in the West till the advent of the modern theory of generative grammars in the last few decades. In the beginning, the Western linguists who could not appreciate the algebraic formulation of Pāṇini’s rules, regarded the Astādhyāyī as abstruse or artificial, though such criticisms were not shared by the Indian grammarians the Western critique was muted and eventually it turned into praise when the West itself developed sophisticated notational systems of its own when it realised that
grammars that derive words and sentences from basic elements by a string of rules are obviously in greater need of symbolic code than paradigmatic or direct method of practical grammars of the West. Even to recognise the value of the Pāṇinian formulations, the West had to independently construct comparable systems of grammar in the first place. Chomsky, the major proponent of contemporary generative and transformational grammars refers to Pāṇini’s grammar as ‘a much earlier tradition’ of generative grammar though ‘long forgotten with a few exceptions’. In the view of Kiparsky, Pāṇini’s Astādhyāyi is the most comprehensive generative grammar written so far.

1.9 Astādhyāyi as a Generative Device

In the Pāṇinian perspective, grammar is not understood as a corpus of learning resulting from linguistic analysis but as a device which enables derivation of correct Sanskrit words. The device comprises rules and technical elements which transform the input of word elements of stems and suffixes into the output of correct Sanskrit words. Thus, the Astādhyāyi is literally a generative device. As it is also a system of rules which allows one to decide the correctness of the words derived, at the same time providing them with structural description, the Astādhyāyi may be called a generative grammar in the true sense. The Astādhyāyi is a set of rules capable of formally deriving an infinite number of correct
Sanskrit utterances together with their semantic interpretation. The entire grammar may be thought of as made up of various domains, each domain containing one or more interior domains. The first rule of a domain acts as its governing rule. Given an input string, one scans rules to determine which paths should be followed within the domain. These paths are marked by interior domains, each one headed by a rule that specifies operational constraints and offers selection in accordance with the intent, that is, a set of quasi-semantic notions related to what we know about what we say before we speak or vivakṣa. Where choices are varied in operation and there are numerous items to select from, an interior domain is further responsible for sub-branching in the path resulting in its division into interior domains.

1.10

Though many attempts have been made to discover parallels to modern linguistic notions such as 'deep structure' or 'transformation' in Pāṇinian approach, it is now increasingly realised that the Pāṇinian system of linguistic description is very much different from the various models developed in the modern linguistics in several methodological and foundational issues. While the Pāṇinian system is viewed as a generative device, the inputs to this device are not formal objects such as symbols and strings which are to be later mapped onto appropriate
semantic and phonological representations. The intention of the speaker or vivakṣa plays a prominent role in the Pāṇinian approach. In the derivation system of Pāṇini, one begins\textsuperscript{12} with semantics and ends with utterances that are actually usable.

1.11 \textit{ASTĀDHYĀYĪ AND MODERN FORMAL SYSTEMS}

\textit{Astādhyaḥyā} is recognised as an intricate but tightly logical system comparable to formal systems of modern logic, mathematics or any other contemporary theoretical science in sophistication in view of the various technical devices used in the grammatical theory construction such as samijā 'technical terms', paribhāsa 'metarules' which circumscribe how the sūtras have to be used, the limitation of utsarga 'general rules' by apavāda 'special rules', the use of adhikāra sūtras 'headings', the convention of anuvṛtti 'recurrence' whereby parts of rules are considered to recur in subsequent rules, the conventions on rule ordering and decision procedures, metalinguistic devices such as the use of anubandhas 'markers' and the use of kārakas to indicate the context of activity, input and change. The important feature in which the Pāṇinian system differs from the modern formal systems is that in spite of employing countless symbols, technical terms and numerous metalinguistic conventions and devices, the Pāṇinian grammar is still a theoretical system formulated very much in the Sanskrit language, even though of an extremely technical-variety-
and not a formal system employing a purely symbolic language. However, some scholars are mistaken in their judgement when they consider the language employed in Pāṇini’s Astādhyāyī as differing from ordinary Sanskrit so ‘strongly that one must speak of a particular artificial language’. This misunderstanding is perhaps due to the fact that the technical language of Pāṇini’s Astādhyāyī abounds in technical terms and devices and differs considerably from ordinary Sanskrit found in non-technical literature. Nevertheless, it is only a technical or śāstric version of Sanskrit, that is, a technical language constructed from ordinary Sanskrit. Many of Pāṇini’s technical devices are arrived at through ‘an abstraction and formalisation of a feature of ordinary language’.

The relation between Pāṇini’s technical language and ordinary Sanskrit can be seen by considering the rule P.6.1.77 iko yan aci, where ik, yan and ac are symbols for groups of sounds, but all the same treated as Sanskrit word bases. The word base ik occurs in the sūtra with genitive ending as ikah, yan with nominative ending and ac with locative ending as aci. The sūtra lays down that the vowels i, u, ṭ, ḷ denoted by ik are substituents to be replaced by y, v, ṭ, ḷ denoted by yan before a vowel ac. The information regarding what should serve as input, output and context is metalinguistically marked with various case
endings taken by the word bases ūk, vaṇ and ač. The
genitive ending īkah indicates that it is the
substituend or input, in accordance with the paribhāsa,
P.1.1.49 sāsthiṣṭhānevyoga. Though there are various
possible meanings indicated by the genitive case
ending, Pāṇini uses the meta rule P.1.1.49 to delimit
the meaning of the genitive case ending to indicate
only the substituend or the input of a grammatical
operation. The rule P.1.1.49 assigns a meta linguistic
value to the sixth triplet. The rule P.2.3.50 sāsthi
tēse introduces genitive endings when there is to be
denoted a non-verbal relation in general. There are
many such relations such as father-son or part-whole.
The rule P.1.1.49 states a particular relation to be
understood when the genitive is used, namely, the
relation of being a substituend. These metalinguistic
case conventions are neither arbitrary nor artificial.
They serve only to assign a unique meaning when several
interpretation are possible in the ordinary use of the
language.

1.3 Lāghava as Not the Sole Criterion of Pāṇini’s
Exposition

There is a misconception that lāghava
‘brevity’ is the sole raison d’etre of Pāṇini’s
exposition of grammar implying that most of the
techniques employed by Pāṇini are mere arbitrary
devices to achieve brevity in exposition. Some have
attributed this tendency to possible shortage of
writing material or to the possible necessities of a purely oral tradition placing heavy demands on memory. Though it is true that the Indian grammarian did rejoice at the saving of even half a mora in their exposition, the saving of moras was not to be achieved by arbitrary devices. Hundreds of moras could have been saved by selecting the accusative case instead of the genitive case for marking the input of a rule, but that would amount to a drastic deviation from the ordinary usage of the accusative case.

1.4 PĀṇINIAN CRITERION OF BREVITY AS SYSTEMATIC ELIMINATION OF REDUNDANCY

The metalinguistic device of the use of cases to indicate context, input and output in grammatical operation is not an arbitrarily chosen convention for achieving mere brevity, but is actually a technical device founded on the basic structure available in the ordinary Sanskrit language and which serves to render the language unambiguous and more precise. This aspect is true of all the technical devices employed in the Pāṇinian grammar. It is now argued that the Pāṇinian use of anuvṛtti is not an artificial device for merely achieving brevity, but a systematic and technical use of real language ellipsis. The criterion of brevity is that the rules are to be strictly purged of all information that is predictable from other information provided in the system. What Pāṇini constantly tries
to eliminate is not moras, but redundancy. Pāṇini not only developed a precise technical language for the formulation of grammatical rules but he also developed sophisticated devices which deal in it both a nature and application of such rules. He has employed the sutra technique of systematisation which was prevalent in his times in the classical śāstric literature. Here again it is generally misunderstood that the sutra style is employed merely for the purpose of achieving brevity in exposition. Though brevity is the hallmark of the sutra technique of systematisation, there are many other equally or even more important criteria that a sutra should satisfy. As characterised in Viṣṇudharmottara purāṇa a sutra should be concise, unambiguous, pithy, comprehensive and free from irrelevancies and blemishes.

1.15 INTERDEPENDENCE OF PĀÑINIAN RULES OR EKAVĀKYATĀ

The Pāṇinian sutras are rules that differ very much from the rules in modern linguistic theory. In modern linguistics rules are treated as statements independent of one another. They seldom require any information from other rules. In contrast to this Pāṇini’s rules are interdependent. In Pāṇini’s systems for the application of a given rule one may at times have to retrieve many rules which may be placed very far in the grammar. This aspect is generally referred in the tradition as ekavākyatā or single context. While interpreting a rule in modern linguistics the
rule hardly needs any help from other rules. In Pāṇini’s approach for the correct interpretation, one usually requires the carrying over of previous or later rules or other elements.

1.6 PĀÑINIAN SYSTEM OF THEORY CONSTRUCTION AS MORE THOROUGH THAN ANY OTHER SYSTEMS

It is this interdependence of rules that necessitated Pāṇini to arrange his rules into domains and subdomains. Pāṇini does not define explicitly several technical aspects of the sūtra method of systematisation such as the use of paribhāsa, adhikāra, upadeśa, asiddha, vipratisedha etc., though they are extensively employed in Pāṇini’s Astādhyāyī. These and similar technical terms are meta-grammatical in nature as they do not refer to concepts about which the grammatical analysis must theorize, but refer to the basic equipment that one brings to the very task of grammatical analysis. Pāṇini’s Astādhyāyī provides a complete characterisation of sanskrit utterances, a characterisation more thorough than what has been possible for any language so far, by devising a system which enables one to generate in the literal sense of the word and also analyse all possible meaningful utterances. Pāṇini’s system is so thorough that it provides the paradigm example of theory construction in Indian tradition.
1.17 PARALLELS BETWEEN PĀṆINI AND MODERN LINGUISTICS

Pāṇini’s grammar demonstrates that it is possible for a theorist to build up a method which can outlast the thinking of his times and project far into the future. Euclid’s Geometry is also another example for this. Whenever a comparison is made between techniques of works so antiquated as Pāṇini’s and modern works, naturally objections are raised that Pāṇini could not have thought like a modern linguist, because he was so much separated in time. However, one cannot help comparing the techniques of Pāṇini and those of modern linguists from the grammatical point of view irrespective of historical aspects. One would only think that such converging of ideas in Pāṇini and modern linguistics has been possible because, one did not much pursue grammar in India from where Pāṇini had left in his times and modern linguistics has caught up. However, it appears, the time has come now, for the modern linguist to understand Pāṇini better than the discontinuous tradition. Only when the modern linguist has equipped himself with modern tools, has he been able to understand Pāṇini clearly. In other words Pāṇini is being gradually discovered, because the modern linguist himself has independently been arriving at a mature stage in theory construction similar to that of Pāṇini.
There is a striking resemblance between Pāṇini's phonological rules which specify the units to be replaced, the replacements, the conditioning or the environment and those framed in modern linguistics. For instance in the rule 6.1.101 akāḥ savarṇe dirghaḥ 'the sounds of ak - group are replaced by corresponding long ones, when followed by homogeneous sounds', akāḥ representing all simple vowels is the unit to be replaced. This is known by the meta rule P.1.1.49 sasṭhi sthāneyoṃ 'the genitive is used to denote that the element to which it is affixed is the substituendum'. In the modern linguistics, we use the clauses 'consonants' and 'vowels' or the symbols 'e' and 'v' instead of specifying the features. The abbreviation 'ak' used by Pāṇini is no different in principle from the abbreviation like 'C' or 'V'. The modern linguist also gives his meta rule similar in principle to that of Pāṇini, when he states that the unit placed on the left of the arrowhead is the one to be replaced. Again, the environment is specified by the locative case affix in savarṇe. This is known by the meta rule P.1.1.66 tasminniti nirdiṣṭa pūrvasya. 'items stated in the locative case denote items before which replacements occur' and the definition of savarṇa is known from the rule P.1.1.9 tulyasyaprayatnam savarṇam 'sounds are said to be homogeneous with each other if they are produced by the same articulatory
effort at a given point in the mouth'. In the modern linguistics too, an expression 'in the environment' or 'slant line' in the formulaic representation is given to indicate the locative force.

Similarity between the methods of Pāṇini and the modern linguist is striking as regards use of abbreviatory conventions which represent generally a natural class of sounds, specifying contexts for replacement and meta rules for interpreting the operation.

One of the aspects of rule formation in modern linguistics is the idea of collapsing of two or more rules into one when the conditioning in each rule is the same, the difference between them being the units replaced. For instance, when there are two rules, one specifying devoicing for stops and another for continuants in the same environment, such as word-final, the two rules could be collapsed into one rule. One such formulation of Pāṇini for rule abbreviation is the sutra P.8.2.23 'samyoṣṇa-ntasya lopah' which provides for the dropping of the last consonant in a cluster in word-final position. A rule stating that a voiceless consonant is replaced by a voiced one in intervocalic position is another instance. A rule of this type is found in P.6.1.77 'iko yan aci' which provides for replacement of yan sounds, that is, y, v, x, l, for ik-sounds, that is i, u, x, l, when followed by a vowel. Four individual rules are included in this
stating the replacement for each one of the four sounds included in the abbreviation ik in the same environment. The replacement is effected according to the paribhaṣa rule P.1.1.50 'sthāne'ntaratamāh' which provides for the interpretation of the appropriate substitutes, stating that given a choice of substitutes, that one occurs which is most proximate to the substituendum. The invoking of one meta-rule, P.1.3.10 is needed here, which explains that the replacements are according to the order of enumeration when the abbreviations are expanded.

The application of certain rules in grammatical descriptions may be valid only within specified contexts and such rules are termed context-sensitive. If no specific context is needed for the operation, then the rules are termed context-free. Pāṇini makes use of only context-sensitive rules for the description of Sanskrit. Prima facie, it appears that context-sensitive grammars are essentially richer than context-free grammars. However, to resolve this question conclusively one requires a method of measuring the efficiency of context-sensitive and context-free rules. If it can be shown context-sensitive rules are more efficient in describing a natural language than context-free rules or a combination of context-sensitive and context-free rules, then we may be able to appreciate Pāṇini's stand of sticking to only context-sensitive rules in his
description. Perhaps, techniques of information theory, a branch of communication engineering, may come in handy in evaluating the relative efficiencies of context-sensitive and context-free rules in the description of a natural language such as Sanskrit.

Modern linguists interpret compounds as derivatives of underlying sentences. Pāṇini also held a similar view as may be seen from the meta-rule P.2.1.1 ‘śamarthāḥ padavidhiḥ’, padavidhiḥ is interpreted as an operation which has its domain in the compounds and śamarthāḥ is interpreted either as that which is capable of expressing the sense of a sentence on analysis or that which depends on words as connected in sense, in other words, a rule relating to words whose meanings are connected together. Thus, the rules of compound derivation operates on a sequence of semantically compatible and syntactically bound padas and the result of their operation is a single entity capable of expressing the meaning which is expressed by the syntactically bound padas. Thus the syntactically bound padas and the compound must be synonymous in meaning. The description of Sanskrit compounds in Pāṇini is not taxonomic as his approach is not to state any criteria for identifying and classifying certain expressions as compounds, but to formulate rules for deriving compounds from abstract sequences of syntactically related padas.