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usepackage{times}
usepackage[tone]{tipa}
usepackage{diatop}
usepackage{pdflscape}
usepackage{enumerate}
usepackage{pst-pdf} %Needed for ref command

%begin Sanskrit
%Authors

%other proper names

%Titles

%common words

%Dravidian authors, titles, a few common words
%end Sanskrit

%Other commands

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pagenumbering{roman}

title{Part III. Foundations of grammar}
maketitle
setcounter{chapter}{9}
setcounter{secnumdepth}{4}
setcounter{tocdepth}{4}
tableofcontents
listoftables

chapter{Linguistics in India}
author{large{Peter M. Scharf}}
pagenumbering{arabic}
section{Origins of linguistics}
10.1   Origins of linguistics

A strong tradition of linguistic analysis developed in early India associated with the composition

and preservation of the ancient Vedic hymns.   By the end of the second millennium textsc{bce}, there were in existence already large collections of verse and prose texts learned aurally, the oldest of which is the *Ṛgveda*.   Mnemonic techniques were developed to preserve the texts and their comprehension including by about the seventh century textsc{bce} the word recitation (*padapāṭha*) of the *Ṛgveda*.   In the course of natural language change over a long period of time, the language in the preserved Vedic texts became less familiar to those who used and preserved it and more in need of deliberate study and explication.   By the middle of the first millennium textsc{bce} six branches of knowledge ancillary to Vedic texts proper and known as ``limbs of the the veda'' (*vedāṅga*) included four concerned with linguistic analysis: metrics (*chandas*), etymology (*nirukta*), phonetics (*śikṣā*), and grammar (*vyākaraṇa*).

subsection{Metrics (*chandas*)}
10.1.1 Metrics (*chandas*)

Specific names of meters mentioned even in the oldest layers of the *Ṛgveda* date the discipline of metrics (*chandas*) back into the second millennium textsc{bce}.   Meters of two types are common in Sanskrit poetics: those that consist in a fixed number of syllables in certain verse segments, and those that consist in a fixed number of morae in certain verse segments.

subsection{Lexicography (*nighaṇṭu*) and etymology (*nirukta*)}
10.1.2 Lexicography (*nighaṇṭu*) and etymology (*nirukta*)
label{nirukta}

Etymological remarks appear in prose commentary on Vedic hymns and ritual practice called Brāhmaṇa composed early in the first millennium textsc{bce}.   Brāhmaṇa authors use etymology liberally to justify significance they wish to attribute to certain terms found in ritual liturgy.   The first such remark in the *Aitareyabrāhmaṇa* associated with the *Ṛgveda*, for instance, explains that a preliminary offering is called *iṣṭi* because the deities desired (*aicchan*) to set in motion (*praiṣam*) the ceremony (*yajña*) with the preliminary offerings (*iṣṭibhiḥ*) (*Aitareya-brāhmaṇa* 1.1.2).   The author derives the term *iṣṭi* `preliminary offering' from the verbal root *iṣ* `desire' by using a finite form *aicchan* derived from that root in his statement of the reason that an *iṣṭi* is what it is.   Such derivations demonstrate their authors' intentions, though they are erratic and often linguistically faulty.   In the present example, the term *iṣṭi* is in fact derived from the verbal root *yaj* `worship', not from the verbal root *iṣ* `desire'.

In the middle of the first millenium Yāska composed a commentary principally on a thesaurus of Vedic terms called *Nighaṇṭu*.   The first three chapters of the *Nighaṇṭu* contain lists of synonyms; the fourth contains three enumerated lists of polysemous words; and the fifth contains six lists of the names of deities.   The *Nighaṇṭu* initiated a long and full tradition of lexicography described in four hundred pages by Vogel (1979) in his contribution to Gonda's series on the history of Indian literature.   Yāska's commentary stands at the beginning of a rich tradition of commentary upon such texts, including the *Rāmāśramī* on the famous *Amarakośa*.   The *Nirukta* consists of twelve chapters plus an appendix that explain the meaning of the Vedic words.   Each of the twelve chapters of the *Nirukta* proper comments upon one of the lists in the *Nighaṇṭu*. The *Nirukta* was expanded by the addition of an exposition of its explanatory method.   Yāska's statement of the purpose of the *Nirukta* captures well the pedagogical purpose motivating the

composition of this early linguistic work in the Vedic tradition.   He (1.20) states, ``Recent sages, tired of teaching, composed this book in order that subsequent Vedic scholars would be able to comprehend certain passages'' (*upadeśāya glāyanto 'vare bilmagrahaṇāyemaṃ granthaṃ samāmnāsiṣuḥ*).

Etymological assertions in the *Nirukta* state that a certain nominal derives from a certain verbal root, for example,
begin{quote}
cittaṃ cetateḥ (*Nirukta* 1.6)
Cittam (mind) is derived from (the root) *cit* (to know).
(Sarup 1927: 10)
end{quote}
Some etymological assertions provide a familiar synonym for the obscure word in addition to an etymological derivation, for example,
begin{quote}
vayāḥ śākhā veteḥ (*Nirukta* 1.4)
Vayāḥ means branches, (and) is derived from (the root) *vī* (to move).
(Sarup 1927: 8)
end{quote}
Some etymologies in the *Nirukta* are less explicit; they utilize semantic statements from which a phonetic analysis is easily inferred. *Nirukta* 2.14 explains the six words contained in *Nighaṇṭu* 1.4.   The first, *svar*, is explained as follows:
begin{quote}
svar ādityo bhavati. su araṇaḥ. su īraṇaḥ. svṛtaḥ rasān. svṛtaḥ bhāsam jyotiṣām. svṛtaḥ bhāseti vā.
end{quote}
Sarup (1920-27: part II, p. 30) translates, ``*Svar* means the sun; it is very distant, it has well dispersed (the darkness), it has well penetrated the fluids, it has well penetrated the light of the luminaries, or it is pierced through with light.''   Sköld (1926: 360) points out that the explanations imply derivation from the preverb *su* plus the word *araṇa* `distant', *īr* `set in motion', or the root *ṛ* `go'.   The word *araṇa* is itself a derivate of the verb *ṛ* `go'.   Although the semantic explanations do not make explicit statements about phonetics, the analysis using familiar derivates of common roots makes the inference of phonetic analysis obvious.

Although the etymologies in the *Nirukta* vary in their linguistic accuracy, the sections of the *Nirukta* that explicitly detail the method of the text already show a sophisticated awareness of phonetics and systematic linguistics.   It is likely that these sections were added to an earlier *Nirukta* text after some of the developments in phonetics and grammar described below.   In outlining this procedure and in distinguishing it from that of the grammarians, the author of the introduction to the *Nirukta* shows his familiarity with the concepts of derivation including original grammatical elements, affixation, sound changes, secondary derivatives, and compounds.   He considers the verbal roots (*dhātu*) to be the original forms or bases (*prakṛti*), and nominal forms to be the modifications of them (*vikṛti*), and speaks of the latter as `born' from the former.   The procedure described recognizes the relationship between the final *h* of verbal roots and the voiced aspirated stops in their nominal derivatives, between semivowels and their corresponding vowels, and between vowels of different length.   Finally, the procedure described

recognizes the need to parse secondary nominal derivatives and compounds at their proper morphemic boundaries. The author of the *Nirukta* affirms the view of Śākaṭāyana and etymologists that all words are analyzeable into basic verbal roots in disagreement with Gārgya who holds that not all are (*Nirukta* 1.12).

subsection{Phonetics (*śikṣā*)}
10.1.3 Phonetics (*śikṣā*)
label{phonetics}

Sanskrit phonetics has been a topic of investigation since phoneticians analyzed interword sound alterations in Vedic hymns at the beginning of the first millennium textsc{bce}. Śākalya composed the word-recitation (*padapāṭha*) of the continuous recitation (*saṃhitāpāṭha*) of the *Ṛg-veda* in the seventh century textsc{bce}. Similar analyses were undertaken of other Vedic hymn collections, and several additional modes of recitation were built upon them. The earliest texts in the discipline of Śikṣā consist of sets of phonetic rules that account for the derivation of saṃhitā texts from their corresponding padapāṭha texts. Early Śikṣā texts, composed during the sixth through fourth centuries textsc{bce} (Staal 1972: xxiv), were proper to particular branches (*śākhā*) of the Veda and hence are termed *prātiśākhya*. The Prāti-śākhyas and later texts called *śikṣā* also systematically analyze phonetics, phonology, and prosody. While Varma (1929) evaluates early Indian phonetic observations, Allen (1953) provides, as he himself says (1953: iii), ``a guide to the appreciation of the earliest phoneticians.''

The phonetic and phonological analyses in these texts differ from each other and from that assumed for the operation of Pāṇinian grammatical rules (discussed below). Yet these analyses share a number of characteristics. Indian phoneticians generally classify sounds according articulatory features including place of articulation in the vocal tract, stricture, voicing, aspiration, nasalization, length, and relative pitch. Indian phoneticians categorize the duration of segments by recourse to the measure of the short vowel. A short vowel measures one mora; long vowels, two morae; prolonged vowels, three morae; consonants, half a mora. In terms of pitch, Indian phoneticians categorize vowels as high-pitched, low-pitched, circumflexed, or monotone. A circumflexed vowel is described as dropping from high to low, and a series of syllables is monotone if devoid of relative distinction in pitch.

Some of the observations of the phoneticians are extremely acute. They describe nasals called *yama* that occur as transition sounds between an oral stop and a subsequent nasal stop. They describe another nasal segment called *nāsikya* (ⁱh) that occurs as a transition between *h* and a subsequent nasal stop *ṇ*, *n*, or *m*. They describe unreleased stops that occur before stops, and reduced semivowels corresponding to *y*, *l*, and *v* that occur word-finally; both are termed *abhini-dhāna*. They describe firmer approximants *y* and *v* that occur word-initially, and lighter approximants *y* and *v* that occur word-finally in several dialects. They describe the rare short simple vowels \uE and \uO and slightly lengthened short vowels that occur in Vedic recitation. Phoneticians describe vowel segments called *svarabhakti* that break up certain consonant clusters. Vedic phonetic treatises also describe contextual variation of nasals and vowel pitches.

Ancient Indian treatises themselves report phonetic differences that reflect dialectal differences. For example, *Ṛkprātiśākhya* 1.45 states that *s*, *r*, and *l* are produced at the base of the teeth, but

1.47 reports that some teachers hold *r* to be produced at the alveolar ridge (*barsvya*). Differing from both, the *Pāṇinīyaśikṣā* classifies *r* as coronal. Alveolar, coronal, and velar places of articulation are reported for vocalic *ṛ*.   Ancient treatises report differences concerning sandhi of *m* before semivowels, sandhi of the glottal fricative (*visarga*) before an initial consonant, sandhi of final *y* and *v*, epenthesis of an unvoiced stop between a spirant and following unvoiced stop, the relative duration of subsegments that compose diphthongs, types and durations of the nasal segment *anusvāra*, and tonal phonotactics. Varma (1929: 53--54) demonstrates that such differences found in Indian phonetic treatises reflect dialectal variation by showing that the reflexes of Sanskrit words in subsequent regional languages originate in them. He (8--9) shows, for instance, that dental and coronal pronunciations of vocalic *ṛ* correlate to reflexes in regional Ashokan inscriptions and modern languages that developed subsequent dental versus retroflex geminate consonants respectively.

Ancient Indian phonetic treatises differ not just in the facts they report but also in their phonological systems.   Different phoneticians analyzed Sanskrit sounds in accordance with different structures of phonetic features.   Phonetic treatises vary in the number of places of articulation, the number of degrees of stricture, and other features utilized to distinguish sounds. Hence while most phonetic treatises enumerate seven places of articulation, including the nasal cavity and distinguishing the velar region from the glottal, Pāṇini deals with just five -- guttural, palatal, coronal, dental, and labial, combining glottal and velar places under the term `guttural' (*kaṇṭhya*). He avoids having to posit different places of articulation for distinguishing between glottal and velar fricatives by referring to the segments instead. Pāṇinian grammarians consider nasality as a means, rather than a place, of articulation. Thereby they avoid complications that would result from considering all nasals (their distinct oral places of articulation notwithstanding) as homorganic.

Āpiśali includes a full set of eight stricture distinctions, including five degrees of openness, as opposed to just three --- contact, slight contact, and open --- used by Śaunaka.   While most ancient Indian phoneticians recognize just two dispositions of glottal aperture --- closed and open --- Śaunaka recognizes an intermediate disposition, only recently recognized as accurate by modern phoneticians, to account for the production of voiced spirants and voiced aspirated stops. Also significant is Śaunaka's recognition of the implication of vocal fold disposition on pitch: stretched vocal chords imply high pitch, slack vocal chords imply low pitch, and a tossing (*ākṣepa*) in the disposition of the vocal chords implies declining pitch (*svarita*).

Significantly, certain Indian phoneticians give particular prominence to features. A few explicitly state that features are entities distinct from both articulatory processes and phonetic segments and serve as the elements of which the latter are composed. Such analyses directly inspired feature analysis in modern linguistics. Most conspicuously, Āpiśali explicitly describes the active articulators of sounds, anticipating the approach adopted by the contemporary phonologist Morris Halle.   Beyond classifying sounds according to their common features, the *Āpiśaliśikṣā* operates with the features associated with those sound classes. After classifying sounds according to their place of articulation, the *Āpiśaliśikṣā* explicitly associates these sound classes with articulators. This method of description gives an operative role to features beyond noting shared characteristics of segments.

The *Āpiśaliśikṣā* goes on to clarify that it establishes articulatory features intermediate between the articulatory processes themselves and sets of sounds with shared properties. After already categorizing sounds according to their common extrabuccal articulatory processes and resultant characteristics, the next section establishes that articulatory processes produce features that in turn produce other features.   For instance, according to *Āpiśaliśikṣā* 8.7-8, the extrabuccal features that are associated with the glottis imply particular features of the larynx, which in turn imply voice features.

Other Indian phonetic treatises establish a hierarchy in their systems of features. Some features are restricted to a domain in which they are contrastive. The *Ṛk-* and *Taittirīyaprātiśākhya*s concur with the *Āpiśaliśikṣā* in restricting the features of voicing (*ghoṣa*) and non-voicing (*aghoṣa*) to consonants, while the former allow the feature contrast between breath (*śvāsa*) and voice (*nāda*) to apply to all phones. According to Śaunaka in *Ṛkprātiśākhya* 13.3--6, breath and voice are featural entities in their own right from which all speech segments are produced: breath is the material of voiceless segments; both breath and voice are the material of voiced aspirates and *h*; and voice is the material of the rest.

Certain sections in the *Ṛkprātiśākhya* and *Atharvaprātiśākhya* name both features and segments as the constituents of other segments. While at first glance they seem thereby to confuse features and segments, they demonstrate a penetrating phonological analysis in terms of constituents that are more fundamental than segments.   *Ṛkprātiśākhya* 13.15 reports the view of others that the segments *a* and the nasal segment *anusvāra* constitute the voicing in non-nasalized voiced stops and nasal stops respectively. 13.6--17 attributes to others the view expressed in *Āpiśaliśikṣā* 4.9--10 that the unvoiced aspirates contain the fricative produced at the same place of articulation (i.,e. *kh*, *ch*, *ṭh*, *th*, *ph* contain *[Z]*, *ś*, *ṣ*, *s*, *[V]*, respectively) and that the voiced aspirates contain *h*.

Similarly, the commentary on *Atharvaprātiśākhya* 1.10 reports that some consider there to be only five stops (the first in each series). These become differentiated by the addition of certain features. United with the unvoiced fricatives, they become the unvoiced aspirates; united with voicing, they become the voiced deaspirates; united with their corresponding fricative in addition, they become the voiced aspirates; and united with voicing and nasalization, they become nasal stops.   These and similar issues are discussed at greater length by Scharf and Hyman (2011).

subsection{Grammar (*vyākaraṇa*)}
10.1.4 Grammar (*vyākaraṇa*)

The systematic analysis of utterances into words, and of words into morphemes, is evident already in Śākalya's word-by-word recitation (*padapāṭha*) of the *Ṛgveda*.   Similar analyses were undertaken of the other three Vedic hymn collections and several additional modes of recitation were built upon them for the purpose of preservation of the Vedic hymns.   Such analysis is referred to in Pāṇini's grammar, as is the grammatical analysis of several predecessors whose work is no longer extant.

section{{Pāṇini}an grammar}

10.2   Pāṇinian grammar
subsection{Literature}
10.2.1 Literature
subsubsection{Rules}
10.2.1.1   Rules
label{litrules}

By the early fourth century textsc{bce} Pāṇini had composed the *Aṣṭādhyāyī*, consisting of nearly 4,000 rules in eight chapters (*adhyāya*) of four sections (*pāda*) each, that gives a precise and fairly complete description of late Vedic Sanskrit.   Pāṇini drew upon the work of predecessors and mentions ten by name.   Yet no independent pre-Pāṇinian grammatical treatise survives, and the few extant grammatical treatises attributed to pre-Pāṇini grammarians have been shown to post-date Pāṇini.   The *Āpiśaliśikṣā* may well be authored by the same Āpiśali to whom Pāṇini refers, but extant grammatical treatises attributed to Śākaṭāyana and Kāsa-kṛtsna are later productions, and the attribution of statements to an Aindra grammar mistakenly reifies the participation of the god Indra in certain inherited legends.

In the fourth or third century textsc{bce}, Kātyāyana appended approximately 4,300 brief statements (*vārttika*s) to 1,245 of Pāṇini's rules.   Kātyāyana's vārttikas examine the formulations of Pāṇini's rules, their relation to other rules, suggest modifications, and also address the fundamental principles presupposed.   The *Aṣṭādhyāyī* and its accompanying lists as well as Kātyāyana's vārttikas were composed orally and received aurally and hence adopt techniques to maximize brevity.   The rules themselves are composed in brief aphorisms.   They are organized to take advantage of ellipsis by expecting that terms in preceding rules recur in subsequent rules and by the use of recurring headings (*adhikāra*).   They utilize short, artificial technical terms and indicatory markers.   The fact that phonetic segments are employed as markers itself indicates that the linguistic system was composed and transmitted aurally.   In the middle of the second century textsc{bce}, Patañjali composed his monumental commentary, the *Mahābhāṣya*, on Kātyāyana's vārttikas and independently on 468 sūtras of the *Aṣṭādhyāyī*.   The work imitates and is clearly based upon the live interaction between teacher and students engaged in an investigation of the scope, formulation, and implications of rules.

Pāṇinian grammar has generated an abundant literature in the form of commentaries on the *Aṣṭādhyāyī* and subcommentaries on them.   Extant running commentaries on the *Aṣṭādhyāyī* include the *Kāśikā* of Vāmana and Jayāditya, written in the seventh century textsc{ce}, the *Bhāṣāvṛtti* of Puruṣottama-deva in the early twelfth century, and the *Vyākaraṇamitākṣara* of Annam-bhaṭṭa and the detailed and interpretive but incomplete *Śabdakaustubha* of Bhaṭṭoji-dīkṣita (early seventeenth century).   The *Bhāgavṛtti* of Vimala-mati, written in the ninth century, is no longer extant, and the *Durghaṭavṛtti* of Śaraṇa-deva, written in 1172, focuses on the derivation of about five hundred difficult forms.   The *Rūpāvatāra*, written by the Śrīlaṅkan Buddhist Dharma-kīrti in the tenth or eleventh century, the *Prakriyākaumudī* of Rāma-candra (c.~1400), the *Prakriyāsarvasva* of Nārāyaṇa-bhaṭṭa (1616) and the *Siddhānta-kaumudī* of Bhaṭṭoji-dīkṣita reorder and comment on rules of the *Aṣṭādhyāyī* in topics such as technical terms, metarules, sandhi, nominal inflection, feminine affixes, thematic roles, secondary nominal derivates, compounds, verbal inflection, secondary verbal derivates, and primary nominal derivates.   The latter includes Vedic rules and accentuation omitted by

Dharma-kīrti and treated briefly by Rāma-candra.

Many of these commentaries on Pāṇini's *Aṣṭādhyāyī* generated their own traditions of subcommentary, particularly the *Mahābhāṣya*, *Kāśikā*, and *Siddhāntakaumudī*.   Unfortunately Bhartṛ-hari's *Mahābhāṣyadīpikā* commentary on the *Mahābhāṣya* (fifth century) exists only in a single fragmentary and corrupt manuscript ({āhnika}s 1-7 with lacunae).   However, Kaiyaṭa's *Pradīpa* commentary on the whole of the *Mahābhāṣya* in the eleventh century incorporated much of Bhartṛ-hari's work and was itself the subject of Nāgeśa's *Uddyota* commentary in the late seventeenth or early eighteenth century.   The *Pradīpa* was the subject of several other commentaries, and the *Uddyota* was commented on by Nāgeśa's student Vaidya-nātha.   The *Kāśikā* was commented upon in the *Kāśikāvivaraṇapañjikā* by Jinendra-buddhi in the eighth or ninth century and in the *Padamañjarī* by Hara-datta in the thirteenth century.   Commentaries on Bhaṭṭoji-dīkṣita's *Siddhāntakaumudī* include his own *Prauḍhamanoramā* `pleasing to the learned' and *Bālamanoramā* `pleasing to students', and the former was commented on in the *Bṛhac-chabdenduśekhara* by Nāgeśa.   The tradition of grammatical commentary continues in Sanskrit, Indian vernacular languages, and foreign languages right up to the present.

Staal (1974), Rocher (1975), and Scharfe (1977) have written general surveys of Indian linguistic literature.   Dandekar's (1946-1993) comprehensive bibliography of Indological research includes sections on śikṣā (sections VII.47-53), vyākaraṇa (section VII.75), nirukta (section VII.76), and chandas (section VII.78), lexicography (XI.93), and grammatical philosophy (XIII.102) in each volume.   Cardona (1976, 1999) provides a critical survey of research on Pāṇinian grammar and related fields, which is updated by Houben (2003).

Filliozat (1988) gives an excellent practical introduction to Pāṇinian grammar and its methods. Cardona (1997) gives a sophisticated overview of Pāṇini's derivational system and its foundational principles.   Sharma (1987) discusses Pāṇini's linguistic conceptions and procedures as an introduction to his (1990-2003) translation and commentary on the *Aṣṭādhyāyī*, which replaces the still useful simpler translation and commentary of Vasu (1891).   Böhtlingk (1887) is still a convenient edition, German translation, and analytic apparatus even if Katre (1987, 1968-1969) provides the same in Romanization with English translation.   Thieme's (1935) classic study of the relationship between Pāṇinian grammar and its predecessors cannot go without mention, nor can Filliozat's masterly beginning of a translation and explanation of Patañjali's *Mahābhāṣya* with its principal commentaries.

subsubsection{Subsidiary components}
10.2.1.2   Subsidiary components

Pāṇini's comprehensive system of linguistic description consists of several components besides the set of rules at its center.   The system additionally includes metarules, lexical lists, a phonological list, and a list of additional affixes not taught in the ruleset proper.   The *Aṣṭādhyāyī* itself includes among its rules a number of metarules that govern the syntax of rules, and principles concerning rule application.   Additional principles seen to be applicable in the *Aṣṭādhyāyī* that were not explicitly stated in the ruleset were formulated by commentators, in particular by Patañjali in his *Mahābhāṣya*.   These principles were collected and commented upon in works such as the *Vyāḍīyaparibhāṣāvṛtti*, Puruṣottama-deva's *Laghuparibhāṣāvṛtti*

(c.~1150 textsc{ce}), Sīra-deva's *Bṛhatparibhāṣāvṛtti*, and Nāgeśa's *Paribhāṣenduśekhara* (c.~1755 textsc{ce}).

Pāṇini's ruleset makes reference to an accompanying sound catalog (*akṣarasamāmnāya*) and accompanying lexical lists (*gaṇa*) not itemized in the ruleset itself. The sound catalog is used to form abbreviations that serve as an efficient system of reference. Some 282 minor lexical lists are referred to by their incipits in the ruleset. For example, by *Aṣṭādhyāyī* (hereafter abbreviated *A.*) 1.1.27 *sarvādīni sarvanāmāni*, speech forms in the list beginning with *sarva* `all' are termed *sarvanāman* `pronoun'. The members of the list are specified in full or by a paradigmantic set of examples in commentaries on the *Aṣṭādhyāyī*. The most extensive of the lexical lists is a root list (*dhātupāṭha*) incorporated into the *Aṣṭādhyāyī* by *A.* 1.3.1 *bhūvādayo dhātavaḥ*, which terms about two thousand items in the list beginning with *bhū* roots (*dhātu*). Reference to members of the root list is then achieved generally by use of the term *dhātu*.

The Pāṇinian root list is known through numerous manuscripts as well as through several commentaries (Kunjunni Raja 1977: 287-288). Three complete commentaries composed in Sanskrit are extant: the *Kṣīrataraṅginī* of Kṣīra-svāmin (early twelfth century textsc{ce} Kashmir), the *Dhātupradīpa* of Maitreya-rakṣita (mid-twelfth century textsc{ce} Bengal), and the *Mādhavīyadhātuvṛtti* of Sāyaṇa (fourteenth century textsc{ce} Vijayanagara, Karṇātaka). These commentaries provide examples and details of derivates and comment upon variants in the roots, their markers, and their ordering and placement in the various sublists within the root list.

A list of affixes beginning with *u*ṇ is incorporated into the grammar by *A.* 3.3.1 *uṇādayo bahulam*, which states that the affixes occur variously after roots to form conventional terms, and *A.* 3.4.75 *tābhyām anyatroṇādayaḥ*, which allows these affixes in thematic roles other than those stated in the two previous sūtras. A treatise consisting of five chapters, called the *Pañca-pādyuṇādisūtra*, contains specific rules providing affixes beginning with *u*ṇ after certain roots. For instance, the conventional term *kāru* `artisan' is formed by provision of the affix *u*ṇ by the first sūtra. The affix consists of the phone *u* marked with *ṇ*. (The convention in this document is to set markers in bold.) A second treatise in ten chapters, called the *Daśapādyuṇādisūtra* rearranges the five-chapter version with the affixes in alphabetic order. While Pāṇini did not compose either of these treatises as received and may not necessarily have known a set of rules such as they comprise, he at least knew of a list of such affixes and accepted derivations involving them as valid.

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subsection{Architecture}
10.2.2 Architecture
label{architecture}

Pāṇinian grammar describes correct Sanskrit usage by restricting valid utterances to those

derivable in accordance with general and specific generative rules.   Just as earlier phonetic treatises formulated rules to regenerate the continuous text of Vedic saṃhitās from their word-by-word analyses in padapāṭhas, Pāṇini's grammar generates utterances from basic elements under semantic and coocurrence conditions.   The set of rules of the grammar itself presupposes an extremely comprehensive and detailed analysis of the Sanskrit language into basic elements.   These basic elements are roots and nominal bases listed in the dhātu-pāṭha and other lists, those inferrable as being of the same kind in lists of paradigmatic elements (*ākṛti-gaṇa*), those included by specific semantic criteria, and some 464 affixes attached to them by rules of the *Aṣṭādhyāyī*.   Additional nominal bases are included as basic elements under the sole specification that they be meaningful.   By A. 1.2.45 *arthavad adhātur apratyayaḥ prātipadikam*, meaningful speech forms (*arthavat*) other than roots, affixes, and speech forms that end with them are termed *prātipadika* `nominal base'.

From these basic elements, the rules of the *Aṣṭādhyāyī* construct derived roots and nominal bases, words, and utterances.   Roots and nominal bases are generally referred to as preceding contexts in rules that provide affixes after them.   Rules in the third chapter headed by A. 3.1.91 *dhātoḥ* provide affixes after roots, and rules in the fourth and fifth chapters headed by A. 4.1.1 *ṅyāpprātipadikāt* provide affixes after nominal bases, including after nominal bases ending in feminine suffixes added by A. 4.1.3-75.   Verbal affixes include verbal terminations provided by A. 3.4.77-112 in place of variables (the abstract symbol *l* with indicatory markers attached), and nominal affixes include nominal terminations provided by A. 4.1.2.   Speech forms ending in nominal and verbal terminations constitute words and are termed *pada* and retain that status even when terminations are modified.   Derived verbal roots are formed by the provision of affixes after primary verbal roots, nominal bases, and words by A. 3.1.5-32.   A. 3.1.33-90 provide verbal-stem-forming affixes between roots and subsequent verbal terminations.   Derived nominal bases are formed from affixes added to roots, affixes provided by A. 4.1.76-5.4, and by compounding in accordance with rules in A. 2.1-2.2.   These are termed *prātipadika* `nominal base' by A. 1.2.46 *kṛttaddhitasamāsāś ca*.   All such verbal and nominal stems are subject to modification by augmentation, deletion and replacement in accordance with rules in A. 6.4-7.4. Speech forms are subject to accentual modification specified in A. 6.1.158-6.2 and to additional augmentation and prosodic changes specified in A. 6.1.72-157 and A. 8.2-8.4.   The functioning of the rules is facilitated by the classification of elements in accordance with semantic and syntactic criteria and by principles, conventions of reference, and metalanguage articulated in the first chapter.

The partial derivation of a simple sentence will suffice to illustrate the procedure.   The process operates from the point of the speaker so begins with a conception the speaker wishes to express. To derive a sentence meaning, ``Theodore cooks'' (tableref{table-derivation} [[[10.2]]], step 1), one selects the basic speech elements that denote the object and action involved, namely, the nominal base meaning Theodore, and the verbal root meaning cook (tableref{table-derivation} [[[10.2]]], step 2).   The independent actor in the action is termed *kartṛ* `agent' by A. 1.4.54 (step 3).   A. 3.2.123 introduces the abstract verbal affix *laṭ* after the verbal root *pac* on the condition that present time is to be denoted (step 4).   By A. 3.4.78 the *l* is replaced by a basic verbal termination (step 5).   The singular active third person termination *tip* is selected on the conditions that what is to be denoted is an agent, a single entity, and not denoted by a first or second person pronoun in accordance with A. 1.3.78, A. 1.4.22, and A. 1.4.108 respectively

(steps 5a-5c).   The verbal-stem-forming affix *{ś}ap* is added after the root before the verbal termination on condition that an agent is to be denoted (stip 6).   *A.* 4.1.2 provides a nominal termination after the nominal base *devadatta*.   A singular nominal termination is selected on condition that one object is to be denoted (step 7a), and the nominative is selected on the condition that just the meaning of the base is to be denoted since the agent has already been denoted by the verbal termination (step 7b).   The items ending in nominal and verbal terminations now qualify to be termed *pada* `word' by *A.* 1.4.14 (step 8) which allows word-final sound changes to take effect (steps 9-10).

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subsection{Reference}
10.2.3 Reference
label{reference}

Several rules in the *Aṣṭādhyāyī* explicitly establish conventions of speech-form reference used throughout the grammar.   *A.* 1.1.68 establishes the general convention that speech forms mentioned in the grammar refer to themselves, except technical terms that conventionally refer to speech forms.   The first such exception is that *A.* 1.1.69-70 permit vowels and semivowels to refer to all members of their class (regardless of length, pitch, and nasality), and vowels followed by a *t* to refer to those of the same length within that class.   *A.* 1.1.9 establishes that sounds produced with the same stricture at the same place of articulation within the mouth belong to the same class, and *A.* 1.1.10 prohibits consonants and vowels from belonging to the same class. The inclusion of the latter prohibition indicates that Pāṇini, like Śaunaka and unlike Āpiśali, did not recognize a distinction in stricture between the articulatory features of vowels and spirants; otherwise the prohibition would have been unnecessary.

Another convention departing from the autonymous reference of speech forms is markers.   *A.* 1.3.2-8 specify that certain sounds in certain contexts serve as markers in basic elements explicitly taught in the ruleset and accompanying lists.   Sounds used as markers include nasalized vowels; final consonants, except dental stops, *s*, and *m* in inflectional terminations; initial diphones *ñi*, *ṭu*, *ḍu*; palatal and retroflex stops and *ṣ* initial in affixes; and *l*, *ś*, and velar stops in affixes other than those termed *taddhita*.   For instance, a nasalized *u* is attached as a marker to the first consonant in each of the series of consonants produced at the five oral places of articulation.   In accordance with *A.* 1.1.69 *aṇudit savarṇasya cāpratyayaḥ*, a sound marked with *u* refers not only to itself but also to sounds of the same class.   Thus *ku* denotes the five stops *k*, $k^{\mathrm h}$, *g*, $g^{\mathrm h}$, and *ṅ* produced at the velum.   Besides facilitating reference, these markers serve to condition certain operations or to distinguish otherwise homophonous basic elements.   For example, affixes marked with *ñ*, or *ṇ* condition stem-vowel strengthening, while affixes marked with *k*, or *ṅ* inhibit strengthening.   Deleted by *A.* 3.1.9 *tasya lopaḥ*, markers are absent in the form derived by the grammar.

Modifying an inherited ordering of sounds that grouped vowels, stops, semivowels, and spirants together and ordered them within those groups generally by place of articulation from the throat to the lips, Pāṇini's sound catalogue (shown in tableref{table-pratyahara} [[[10.3]]]) lists sounds in a particular order to maximize efficient reference to sound segments. For instance, nasals are grouped together, voiced non-nasal stops are grouped before unvoiced non-nasal stops, and within these groups aspirates are grouped together. The catalogue arranges these sounds in fourteen aphorisms (*sūtra*) each terminating in a consonant which is termed a marker by *A.* 1.3.3. *A.* 1.1.71 lets a sound mentioned in the sound catalogue, taken together with one of the consonant markers that occur at the end of each of the fourteen sūtras in that catalogue, denote itself and all of the sounds listed between. For example, *ik* refers to the vowels *i*, *u*, *ṛ*, and *ḷ*; *ac* refers to all the vowels; and *yaṇ* refers to the semivowels *y*, *v*, *r*, and *l*. Finally, *A.* 1.1.72 lets a speech form refer to an item that ends in the mentioned speech form rather than to itself. Hence *ik* refers to any speech form that ends in a simple vowel other than *a*. These conventions of referring to speech forms establish an extremely powerful technical apparatus that supplements the explicit reference to phonetic features described in section xxxxxref{phonetics} [[[10.1.3]]]. The explicit establishment of such conventions was unprecedented in the history of linguistics and was unmatched in technical literature until the comparable use of superscript and subscript indices as markers in modern technical notation and the explicit introduction of brief technical terms in modern mathematics.

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subsection{Principles, metalanguage and rule types}
10.2.4 Principles, metalanguage and rule types
label{principle}

Rules in the *Aṣṭādhyāyī* are of seven types as shown in tableref{table-ruletypes} [[[10.4]]]. Most of the sūtras in the *Aṣṭādhyāyī* are vidhi sūtras; they specify that certain operations take place. For example, in step 5 in tableref{table-derivation} [[[10.2]]], *A.* 3.4.78 provides that a verbal termination replace the abstract verbal affix *l* after a root, and in step 7, *A.* 4.1.2 provides that a nominal termination occur after a nominal base. These rules, however are general; they list numerous terminations and do not specify which one should occur under which circumstances. *A.* 1.3.78, *A.* 1.4.22, *A.* 1.4.108, *A.* 2.3.46 are niyama sūtras that complement *A.* 3.4.78 and *A.* 4.1.2. They specify which terminations occur under which conditions. Hence in steps 5a-5c in tableref{table-derivation} [[[10.2]]], the third person singular active verbal termination *ti* is selected from among the eighteen verbal terminations provided by *A.* 3.4.78, and in steps 7a-7b, the nominative singular nominal termination is selected from among the 21 nominal terminations provided by *A.* 4.1.2.

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When the statement of a provision is too broad, a negation carves out a subdomain in which the rule does not apply. In addition negative compounds, of which there are 490 in the *Aṣṭādhyāyī*, may state negations. Indian linguists recognize that such compounds make known negations of two types: limiting negation (*paryudāsa*) and canceling negation (*prasajyapratiṣedha*) (see Wujastyk 1993 paribhāṣā 48, *Paribhāṣenduśekhara* 74). A limiting negation makes the positive statement of an operation limited to the domain different from but similar to what the nominal compounded with the negative particle denotes. A canceling negation cancels an operation previously provided for within the domain specified in the statement of the canceling negation independent of the domain of the previous provision. Patañjali shows the application of the limiting negation to ordinary affairs using the term `non-brāhmaṇa' as an example: When told, ``Bring a non-brāhmaṇa," one brings what is other than but similar to a brāhmaṇa, namely, another person. One has not done what was asked if one has brought a lump of earth. The negative compound, while excluding a brāhmaṇa, limits reference to an object similar to a brāhmaṇa, namely, another person. Hence even aside from the negated object itself, the operation applies only to a restricted domain. In contrast, a prasajya-pratiṣedha cancels an operation previously provided for. The cancelation of the operation is a separate statement from the operation's prior provision. Hence, the cancelation applies only to the domain stated in the negative compound. Outside that domain the operation applies unrestricted.

An extension rule (*atideśa*) treats an item like another thereby extending to it properties it does not have or operations to which it would otherwise not be subject. The most far-reaching extension rule in the *Aṣṭādhyāyī*, *A.* 1.1.56 *stānivad ādeśo 'nalvidhau*, provides that replacements are treated like their substituends. For instance replacements for nominal terminations provided by *A.* 4.1.2 are also treated like nominal terminations. In the derivation of the dative singular form *puruṣāya*, preceded by the *a*-final stem *puruṣa* `man', the nominal termination *ṅe* is replaced by *ya* before which the final *a* of the stem is lengthened. The lengthening occurs before a nominal termination denoted by the abbreviation *sup* in accordance with *A.* 7.3.102 *supi ca*. However, since the replacement *ya* is not included in the list referred to by the abbreviation *sup*, the final *a* of the stem *puruṣa* would not be subject to lengthening by *A.* 7.3.102. *A.* 1.1.56 extends the status of the substituend *ṅe* to its replacement *ya* so that the latter is treated as belonging to the list *sup* and does condition the required lengthening.

In tableref{table-derivation} [[[10.2]]], *A.* 1.4.54, *A.* 1.4.14 are sañjñā sūtras. Pāṇini uses 116 technical terms 1,350 times to facilitate the formulation of general rules. While he adopts several terms from general or linguistic usage, such as those for vowel length (*hrasva*, *dīrgha*, and *pluta*), and gender (*strī*, *pums*, *napuṃsaka*) without explicit introduction, he explicitly introduces most of these technical terms for various classes of items. Besides the techniques of phonetic reference described in section xxxxxref{reference} [[[10.2.3]]], Pāṇini intruduces the terms *vṛddhi*, *guṇa*, and *samprasāraṇa* to denote various vowel grades (The vowels *ā*, *ai*, and *au* are termed *vṛddhi*; the vowels *a*, *e*, and *o* are termed *guṇa*, and the simple vowels *i*, *u*, *ṛ*, and *ḷ* are termed *samprasāraṇa*), terms for pitch (*udātta*, *anudātta*, *svarita*), terms for vowel weights in syllables (*laghu*, *guru*), and terms for a penultimate sound (*upadhā*) and for a final vowel plus its syllable coda (*ṭi*). He introduces a term for markers (*it*) and several terms for various types of

deletion (*lopa*, *lu**k***, *ślu*, *lu**p***).   He introduces terms for verbal and nominal bases (*dhātu*, *prāti-padika*), for stems (*aṅga*), for compounds (*samāsa*) and their various types (*tatpuruṣa*, etc.), for active and middle terminations (*parasmaipada*, *ātmanepada*), for first, second, and third person terminations (*prathama*, *madhyama*, *uttama*), for various other classes of affixes (*kṛt*, *kṛtya*, *sarvadhātuka*, *ārdhadhātuka*, *gha*, *taddhita*), for classes of roots (*ghu*), for particles (*nipāta*), indeclinables (*avyaya*), preverbs (*gati*), and prepositions (*karmapravacanīya*), and for thematic roles (*apādāna*, etc.).   While many of the terms he explicitly introduces are specifications of meaningful words, others are extremely brief artificial ones such as *ghu*, *k**u***, *ṭi*, and the most frequent term *it* `marker' which is used 80 times.

Rules in the *Aṣṭādhyāyī* are stated in sūtras ordered and placed under headings to utilize ellipsis to maximize brevity.   Headings and terms from preceding sūtras are understood to recur in subsequent rules to supplement the explicitly stated terms to complete the statement of the rule. A rule that provides an operation in Pāṇinian grammar states that a certain item occurs in place of another item in the context of preceding and following items.   The nominative case is used for the item that occurs, the genitive case for the item repleced, the ablative case for the item in the preceding context, and the locative for the item in the following context.   The provision of an affix after a root or nominal base is achieved by stating the affix rules in chapters three through five under the headings *A.* 3.1.1 *pratyayaḥ* and *A.* 3.1.2 *paraś ca*.   The first lets items subsequently stated in the nominative be termed `affix', and the second qualifies them as occurring after.   The direction word *para* `after' ordinarily governs an ablative (in accordance with *A.* 2.3.29) so that the affix is understood to occur after roots or nominal bases taught in the ablative case.   Where the root or nominal bases are stated in the genitive instead of the ablative, similar syntax is assumed by virtue of the fact that other direction words (such as *paratas*) govern the genitive (in accordance with *A.* 2.3.30).

However, an explicit statement of the significance of the genitive, locative, and ablative case is required to resolve doubt in other rules.   The genitive may indicate any one of a number of relations such as property, ownership, proximity, part, whole, etc.   In order to resolve doubt where the genitive is not susceptible of a single interpretation in its context Pāṇini states the principle in *A.* 1.1.49 *ṣaṣṭhī sthāneyogā*, that a genitive (*ṣaṣṭhī* `sixth-triplet nominal termination') is understood to designate one relation in particular, namely, that of substituend. Pāṇini regularly indicates items to be replaced in the genitive.   For example, according to the following rules, the verbal root *as* `be' is replaced by the verbal root *bhū* `be' when an =ardhadh=atuka affix is to be used, and a simple vowel is replaced by its corresponding semivowel when a dissimilar vowel follows in continuous speech:
A. 2.4.52 *aster bhūḥ* (*ārdhadhātuka* 35).
A. 6.1.77 *iko yaṇ aci* (*saṃhitāyām* 72).
In these rules, the unbound genitives *asteḥ* (*asti* is a citation form of the verbal root *as*) and *ikaḥ* (*i**k*** is a reference to the vowels *a*, *i*, *u*, *ṛ*, *ḷ*) are understood to be substituends by virtue of the metarule *A.* 1.1.49.

Augments, in contrast to affixes, are generally provided to items specified in the genitive rather than in the ablative.   Commentators justify the genitive in the syntax of augmentation by reference to the metarule *A.* 1.1.46 *ādyantau ṭakitau*.   According to this rule, a speech form marked with *ṭ* or *k* is added as the initial or final part respectively of an element in the genitive.

Such a genitive is a partitive genitive signifying the whole of which the augment is a part. Consistent with ordinary Sanskrit syntax, metarules serve to help the student of the *Aṣṭādhyāyī* interpret rules when doubt concerning their interpretation occurs because the rules of ordinary Sanskrit syntax permit ambiguity.

Two additional metarules specify the context of the operation taught in a rule. According to *A.* 1.1.67 *tasmād ity uttarasya*, an ablative that is subject to competing interpretations in a rule signifies that the operation specified takes effect upon the following speech form. *A.* 1.1.66 *tasminniti nirdiṣṭe pūrvasya* similarly serves to interpret a locative not already subject to a definite interpretation as specifying that the operation specified takes effect upon the preceding item. The commentators Kātyāyana and Patañjali clarify that these rules restrict the use of the ablative and genitive to one among the specific senses these cases have in ordinary usage. Both the ablative and genitive are ambiguous as to whether they convey placement before or after. Hence in the rule
A. 6.1.77 *iko yaṇ aci*
the locative *aci* and the ablative *ikaḥ* do not specify whether the vowel (*ac*) precedes or follows the simple vowel (*ik*). Hence, in the string *dadhi udakam*, where both the *i* and *u* are simple vowels (*ik*) and vowels (*ac*), there is doubt concerning whether by *A.* 6.1.77 the semivowel (*yaṇ*) replaces the sound preceding or following the vowel. One would not know whether to replace the *i* by *y* or the *u* by *v*. It is desired that *A.* 6.1.77 apply to the sound preceding the vowel. That will not happen without the explicit statement of the restrictions in *A.* 1.1.66-67.

Some forty metarules are explicitly stated in the *Aṣṭādhyāyī*. Besides those that specify the syntax of rules described above, metarules clarify additional conventions of replacement, let certain replacements have the status of their original and deleted items have persistent effects, allow the derivation of alternate utterances, establish certain conventions of rule precedence and suspension, and other such conventions. Noteworthy is the concept of the persistent effect of a nullified affix. *A.* 1.1.62 *pratyayalope pratyayalakṣaṇam* establishes the convention that even when an affix is deleted the operations it conditions are still carried out. For example, *A.* 1.4.14 *suptiṅantam padam* terms *pada* `word' a speech form that ends in a nominal or verbal termination. The speech form *somasut* `one who has pressed soma' is still termed *pada* even though its nominative singular masculine termination *s* has been deleted by *A.* 6.1.68. The following rule however states a partial negation of this principle. *A.* 1.1.63 *na lumatāṅgasya* disallows operations conditioned by the deleted affix on the preceding stem if the deletion is taught with one of the three terms containing *lu*, i.e. *luk*, *ślu*, or *lup*. Thus *gargāḥ* `descendants of Garga' does not undergo replacement of the initial vowel of its stem by the *vṛddhi* vowel *ā*, despite the fact that such a replacement is conditioned by the affix *yañ*. The affix *yañ* is provided after the stems in the list beginning with *garga* by *A.* 4.1.105 *gargādibhyo yañ* if a descendant is to be denoted. For example, *gārgyaḥ* denotes a descendant of Garga. However, in the plural, the affix *yañ* is deleted by *A.* 2.4.64 *yañañoś ca* (*luk* 58 *bahuṣu* 62) by the term *luk* which is understood to recur from *A.* 2.4.58.

subsection{Syntactic relations}
10.2.5 Syntactic relations
subsubsection{Abstract expressions}
10.2.5.1   Abstract expressions

label{variable}

Pāṇini uses abstract expressions to designate syntactic structures. A noteworthy feature of the statement of the principles in *A*. 1.1.66-67 described in section xxxxxref{principle} [[[10.2.4]]] is the use of pronouns as variables in abstract expressions. The demonstrative pronoun *tad* in the locative (*tasmin*) in the former and in the ablative (*tasmāt*) in the latter stand for any item stated in the locative or ablative in a grammatical rule. The quotative particle *iti* serves to indicate a reversal of the norm for speech forms in the grammar: these pronominal forms refer to their meaning---x[locative] or x[ablative]---rather than the mentioned locative and ablative pronominal speech forms themselves. Declined forms of demonstrative pronouns are similarly used as variables in rules that specify the conditions under which affixes are provided to form derived nominal bases from nominal constituents. The demonstrative pronoun is used in various cases to indicate the syntactic relation that the derivate has to the base thereby specifying the significance captured by the affix. *A*. 4.1.82 *samarthānāṃ prathamād vā* specifies that in the following rules the relevant affix or affixes optionally occur after the first of syntactically and semantically related words in the phrase modeled in the rule. Since the provision of the affix is optional, the derivate alternates with the expression modeled. For example, the first word in each of the six sūtras in tableref{table-taddhita} [[[10.5]]] is a demonstrative pronoun in the accusative, instrumental, dative, ablative, genitive, or locative case respectively. The pronoun stands for any word in that case (compatible with other limiting conditions stated or understood in the rule) in syntactic construction with the second word in the sūtra. *A*. 4.2.59 repeats the accusative pronoun with a second verb. Thus *A*. 4.2.59 provides an affix after a word in the accusative to form a derived base meaning `studies x' or `knows x' which alternates with the stated phrases. *A*. 4.2.1 provides an affix after a word in the instrumental case to form a derived base meaning `dyed with x' on the condition that x is a color. Similarly with the others.

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subsubsection{Thematic roles}
10.2.5.2   Thematic roles
label{karaka}

In order to achieve the complex mapping of speech forms to syntactic and semantic relations, Pāṇini utilizes intermediate syntactic structures called kārakas. The term literally means `actors' and denotes what has now become familiar in modern linguistics under the name `thematic roles'. General rules assign participants playing certain roles in bringing about an action to certain thematic role categories on purely semantic criteria by giving them one of seven terms denoting those roles. The seven terms given to roles on purely semantic criteria are shown in columns 2-3 of tableref{table-karaka} [[[10.6]]]. Specific rules modify assignments based upon co-occurrence conditions. The seven kāraka-terms are subsequently used as conditions for the provision of verbal terminations, primary nominal affixes provided after verbal roots, secondary nominal affixes provided after nominal bases, compounds, and nominal terminations. The

kāraka terms *kartṛ* and *karman* serve as conditions for the provision of verbal terminations in active and passive constructions respectively. The term *hetu* serves as condition for derivation of causative forms by *A.* 3.1.26. Nominal terminations are provided where kārakas have not already been denoted by verbal terminations and other speech forms. Columns 4-5 of tableref{table-karaka} [[[10.6]]] show the nominal terminations conditioned by kāraka terms by general rules. The first through seventh vibhaktis are triplets of nominal terminations used to derive forms in the nominative (including vocative), accusative, instrumental, dative, ablative, genitive, and locative cases.

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subsection{Rule application}
10.2.6 Rule application
label{precedence}
subsubsection{General rules and exceptions}
10.2.6.1   General rules and exceptions

Pāṇini's *Aṣṭādhyāyī* is a systematic treatise that utilizes generalization to capture common features, yet details specifics as well. The grammar states general rules and exceptions to them. The correct operation of the grammar depends upon determining which rules are exceptions to which. The most basic principle of determining rule precedence is that a rule that provides an operation in a narrower domain wholly included within the domain of another rule constitutes an exception to the rule with the broader domain and blocks it from operating in the narrower domain. For instance *A.* 6.1.77 (see section xxxxxref{principle} [[[10.2.4]]]) is the general rule that replaces a simple vowel other than *a* by its corresponding semivowel before a vowel. *A.* 6.4.77 *aci śnudhātubhruvāṃ yvor iyaṅuvaṅau* replaces certain stem-final vowels *i* and *u* occurring before a vowel instead by *iy* and *uv* respectively. Since the domain of the latter is entirely included within the former, *A.* 6.4.77 constitutes an exception to *A.* 6.1.77. While the principle that a rule that applies to a domain wholly included within the domain of another rule constitutes an exception to it is not explicitly stated in the *Aṣṭādhyāyī*, commentators point out that the principle is inferrable. The rule with the narrower domain would have no scope of application if it did not block the more general rule within its own domain. The very fact that wholly included rules have been stated demonstrates that Pāṇini operated with the principle that they constitute exceptions that take precedence over their related general rules. Several other principles of rule selection are operative in the grammar as described in the following sections.

subsubsection{Overriding conjoint classification by sequence}
10.2.6.2   Overriding conjoint classification by sequence
label{sequence}

In contrast to operations, classificatory rules (*sañjñā sūtra*s) generally operate concurrently thereby allowing subclasses and overlapping classes. The same vowel, for instance may

simultaneously be termed short (*hrasva*) by *A.* 1.2.27 *ūkālo 'j jhrasvadīrghaplutaḥ* and high-pitched (*udātta*) by *A.* 1.2.29 *uccair udāttaḥ*.   In order to classify certain items in disjoint classes, Pāṇini states the rules that classify them under the heading *A.* 1.4.1 *ā kaḍārād ekā sañjñā*, which permits only one term to apply to the same entity at a time, and in the purview of the metarule *A.* 1.4.2 *vipratiṣedhe paraṃ kāryam*, which in cases of conflict between rules with overlapping domains has the latter rule apply.   The kāraka rules occur in this section.   Thus an object eligible for more than one classification is assigned exclusively the kāraka class name provided subsequently unless explicitly stated otherwise by the use of the conjunction *ca* `and'. For example, Kātyāyana states in *A.* 1.4.1 vt. 31 and Patañjali explains, ``The term *karman* by 1.4.38 *krudhadruhor upasṛṣṭayoḥ karma* blocks the term *sampradāna*'' (*Mahābhāṣya* [hereafter abbreviated *MBh.*] 1.302.22-23).   Consider sentences (1)-(2).   In (1) Devadatta is termed *sampradāna* by *A.* 1.4.37 by virtue of being the one toward whom anger is felt, which conditions the dative nominal termination in accordance with *A.* 2.3.13.   In (2) Devadatta is eligible to be termed *sampradāna* by the same rule but is also eligible to be termed *karman* by *A.* 1.4.38, which provides the term *karman* for the one toward whom anger is felt under the condition that a preverb occurs with the root *krudh* `be angry' or with the root *druh* `be malicious'.   The latter rule alone applies in accordance with *A.* 1.4.1-2.

begin{enumerate}[(1)]
item*devadattāya krudhyati.*   %(1)
He is angry at Devadatta.}
item*devadattam abhikrudhyati.*   %(2)
He is angry toward Devadatta.}
end{enumerate}

subsubsection{Bracketing}
10.2.6.3   Bracketing

As described in section xxxxxref{architecture} [[[10.2.2]]], Pāṇini's grammar presupposes an analysis of utterances into constituent words (*pada*), words into stems and affixes, and derivable stems into their components.   When rules of the grammar apply to build utterances from basic constituents, a hierarchy is observed: internally conditioned (*antaraṅga*) operations take precedence over externally conditioned (*bahiraṅga*) operations, that is, operations within words take precedence over operations between words, and operations within sub-word components take precedence over operations between such components.   The principle is formalized in *Vyāḍiparibhāṣā* 73 *asiddhaṃ bahiraṅgam antaraṅge*.   In the derivation of *kurutas* `they two make', the verbal termination *tas* occurs after the root *kṛ*, and the stem-forming affix *u* occurs between.   The root *kṛ* plus stem-forming affix *u* as a unit is itself stem to the verbal termination *tas* such that units may be bracketed as follows: (*kṛ-u*)-*tas*.   An operation conditioned by the stem-forming affix *u* is therefore more internally conditioned with respect to an operation conditioned by the verbal termination *tas*.   Consider the conditions causing and inhibiting replacement by a guṇa vowel in this phonetic string.   Replacement of *ṛ* final in the root *kṛ* by its corresponding guṇa vowel in accordance with *A.* 7.3.84 *sārvadhātukārdhadhātukayoḥ* is conditioned by the affix *u*.   On the other hand, replacement of the penultimate vowel *ṛ* of the stem *kṛ-u* by its corresponding guṇa vowel in accordance with *A.* 7.3.86 *pugantalaghūpadhasya ca* is prevented before the verbal termination *tas* because the verbal termination *tas* is marked

with *ṅ* by the extension rule *A*. 1.2.4 *sārvadhātukam apit* (*ṅit* 1).   Replacement by guṇa is negated before affixes marked with *ṅ* by *A*. 1.1.5 *kṅiti ca*.   By virtue of the principle that an internally conditioned operation takes precedence over an externally conditioned operation, guṇa in accordance with *A*. 7.3.84 *sārvadhātukārdhadhātukayoḥ* conditioned by the stem-forming affix *u* takes precedence over the inhibition of guṇa conditioned by the verbal termination *tas* (see Cardona 1998: 413).

subsubsection{Bleeding operations}
10.2.6.4   Bleeding operations

Operations that deprive other operations of their conditions take precedence over them if the latter would not likewise deprive the former of their conditions.   Such operations are among those called `bleeding operations' in today's terminology.   Pāṇini-ans call an operation that deprives another operation of its conditions *nitya* with respect to the other operation if the other operation does not deprive it of its conditions.   The other operation is termed *anitya* with respect to the first operation.   For example, in the derivation of the third person singular present active indicative verb *tudati* `ldots strikes' given *tud-ti* where the verbal root *tud* is followed by the verbal termination *ti*, the stem-forming affix *a* could be introduced by *A*. 3.1.77 *tudādibhyaḥ śaḥ*, or the penultimate vowel *u* of the root *tud* could be replaced by its corresponding guṇa vowel by *A*. 7.3.86 *pugantalaghūpadhasya ca*.   Since replacements have the status of their constituents, guṇa replacement does not eliminate the conditions for the introduction of the stem-forming affix.   Introduction of the stem-forming affix, on the other hand, eliminates the conditions for guṇa replacement, since the vowel *u* would no longer be the penultimate sound before the verbal termination *ti*.   *A*. 3.1.77 is therefore nitya with respect to *A*. 7.3.86 and takes precedence over it.

subsubsection{Suspension of rules and their effects}
10.2.6.5   Suspension of rules and their effects

Rules in the last three quarters of the eighth chapter of the *Aṣṭādhyāyī* are ordered in such a way that prior rules should apply before subsequent ones, and an explicit statement is made in *A*. 8.2.1 *pūrvatrāsiddham* that subsequent rules are suspended with respect to former ones within that section as also the entire group is suspended with respect to the preceding seven and one quarter chapters.   Pāṇini likewise provides for mutual suspension of the effects of rules in the section headed by *A*. 6.4.22 *asiddhavad atrābhāt*, and (by *A*. 6.1.86 *ṣatvatukorasiddhaḥ*) for the suspension of the effects of single replacement rules *A*. 6.1.84-111 with respect to the retroflexion of *s* (*A*. 8.3.59 *ādeśapratyayayoḥ*) and addition of the final augment *t* (*A*. 6.1.71-76). Suspension of rules serves to prevent the undesired feeding to rules as well as to prevent undesired bleeding from general rules.   For example, in the sentence *ko'siñcat* `Who watered?', the single replacement *o*, provided by *A*. 6.1.109 *eṅaḥ padāntād ati*, is considered the final sound of the preceding word as well as the initial sound of the following word in accordance with the principle for single replacements stated in *A*. 6.1.85 *antādivac ca*.   The vowel *o* therefore would serve as the condition for the undesired retroflexion of the following *s* in accordance with *A*. 8.3.59.   Suspension prevents it.

subsection{Indeterminism}
10.2.7 Indeterminism

label{indeterminism}

Although Pāṇini's grammar constitutes a detailed and systematic generative apparatus that adheres to the several principles of rule precedence described in section xxxxxref{precedence} [[[10.2.6]]], these principles alone are not adequate to completely determine rule selection.   The grammar depends upon specific statements of the early commentators Kātyāyana and Patañjali that specify which of these principles is operative in which sections.   For example, assuming that the principle that the latter of two conflicting rules with overlapping domains takes precedence applies throughout the grammar rather than just in *A.* 1.4-2.4, Kātyāyana states that the augment *num* occurs in precedence over guṇa, vṛddhi, and certain other operations by virtue of the opposite principle, i.e. the principle that the prior rule applies in cases of conflict (A. 7.1.96 vt. 10, *MBh.* 3.275.23.).   Moreover, Patañjali often comments that explanation is required to deliver the correct understanding of a rule (*vyākhyānato viśeṣapratipattiḥ. MBh.* 1.6.26 et alibi; *Vyāḍiparibhāṣā* 52) and that one doesn't understand speech forms just from the rules but also from explanation (*na hi sūtrata eva śabdān pratipadyante kiṃ tarhi vyākhyānataś ca MBh.* 1.11.20-21 et alibi).   The subsections 1-2 discuss two ways in which commentators recognize indeterminism in the grammar and resort to linguistic convention or prior knowledge of outcomes to determine derivational processes.   Subsection 3 discusses rules in the *Aṣṭādhyāyī* itself that deliberately allow indeterminate variation, and the last subsection reveals theoretical disagreement as to how far grammatical specification should extend into the lexicon.

subsubsection{Linguistic convention (*vivakṣā*)}
10.2.7.1   Linguistic convention (*vivakṣā*)

Section xxxxxref{sequence} [[[10.2.6.2]]] described how participants in action are assigned the kāraka term that occurs later in accordance with the principle stated in *A.* 1.4.2 that the later rule applies in cases of conflict between rules with overlapping domains.   The example provided there shows a case in which a co-occurring speech form is a condition for the change in syntax reflected by the different kāraka classification.   Kātyāyana and Patañjali adduce examples in which a change in syntax is due solely to a speaker's intention of participants in action in roles other than their proper ontological roles.   Legitimate utterances in which items are spoken of in roles other than their proper ontological roles are derived by extending the semantic condition for the application of a kāraka term to one intended by a speaker.   In sentence (3), for example, the bow (*dhanus*) is spoken of in its proper ontological role as the fixed point of departure from which the arrow (by means of which Devadatta pierces the target) emerges.   As source, the bow is termed *apādāna* by *A.* 1.4.24 *dhruvam apaye 'pādānam* which conditions a fifth-triplet nominal termination by *A.* 2.3.28 *apādāne pañcamī* by virtue of which the word *dhanus* appears in the ablative case.   In sentences (4) and (5), however, the word *dhanus* appears in the instrumental and nominative cases respectively.   It was understood that the different cases embody different conceptions the linguistic community holds of the roles played by the denoted objects.   Kātyāyana and Patañjali incorporate linguistic conception into the grammatical procedure that derives these syntactic structures.   Kātyāyana adduces (4)-(5) as examples of the application of the principle that the later term applies stated in *A.* 1.4.2.   Patañjali explains that in (4)-(5), the bow is still elligible for the class term *apādāna* by virtue of being the fixed point of departure.   Yet in the derivation of (4) the term *karaṇa* `instrument' provided by *A.* 1.4.42 and in (5) the term *kartṛ* `agent' provided by *A.* 1.4.54 override the term *apādāna* `source' provided

by *A.* 1.4.24 because they are provided later (*MBh.* 1.302.11 - 1.303.5).

Later commentators, however, adduce examples that would violate the rule precedence principle stated in *A.* 1.4.2. Consider sentence (6). Helā-rāja, the tenth century commentator on Bhartṛ-hari's *Vākyapadīya*, states, ``Although the pot in (6) is recognized as being adhikaraṇa `locus', it attains to being karaṇa `instrument' by a speaker's intention, by virtue of bringing about cooking more quickly because it is a thinner vessel''. Because the pot is the substrate of cooking, the term *adhikaraṇa* obtains by *A.* 1.4.45. Because it is intended as the most efficacious in cooking, the term *karaṇa* obtains by *A.* 1.4.42. By *A.* 1.4.1-2, only the latter term, *adhikaraṇa*, should apply. However, against the hierarchy of rules, the earlier term, *karaṇa* applies. Bhartṛ-hari and his successors conclude from examples such as (6) that there is no hierarchy of kāraka rules, and that kāraka classification depends more loosely on a speaker's intention. Bhartṛ-hari writes (*Vākyapadīya* 3.7.3ab), ``The employment of the kārakas is dependent upon the attitude of the intellect'' (*sādhanavyavahāraś ca buddhyavasthānibandhanaḥ*). The freer use of a speaker's intention as a criterion that overrides the stated rule-selection principle suggests that these later commentators do not consider the derivational process to be fully determined by explicit principles.

begin{enumerate}[(1)]
setcounter{enumi}{2}
item*Devadattaḥ dhanuṣaḥ nirgatena śareṇa lakṣyaṃ vidhyati.* %(3)
Devadatta pierces the target with an arrow emerged from his bow.
(implied by Nāgeśa IB.286-87, 288) [Roh 2.315, 317])}
item*dhanuṣā vidhyati.* (1.4.1 vt. 30; *MBh.* 1.302.11) %(4)
        He pierces (the target) with a bow.}
item*dhanur vidhyati.* (1.4.1 vt. 30; *MBh.* 1.302.12) %(5)
        The bow pierces (the target).}
item*sthālyā pacyate.* (*Vākyapadīya* 3.7.91) %(6)
        (Rice) is cooked by means of a pot.}
end{enumerate}

subsubsection{Rule versus target}
10.2.7.2   Rule versus target

As mentioned in section xxxxxref{indeterminism} [[[10.2.7]]], Kātyāyana assumed that the principle that the later of two conflicting rules with overlapping domains takes precedence applies throughout the grammar and specified exceptions to it. Without such an assumption and those specifications the procedure of the grammar remains indeterminate, and one is required to rely upon knowledge of outcomes---that is, knowledge of the correct forms to be derived---in order to determine rule precedence. In order to avoid the necessity of stating Kātyāyana's specification of exceptions to the principle that the later rule applies in cases of conflict, Patañjali proposes to reinterpret the principle. He adduces evidence of the use of the term *para*, previously understood in *A.* 1.4.2 to mean emph{later}, instead to mean emph{desired}. He thereby reinterprets the principle to specify that the most desired rule takes precedence where there is conflict between rules with overlapping domains (*MBh.* 1.306.4-10). By departing in this way from a mechanistic procedure for determining the application of rules and relying rather

on knowledge of the desired outcome of the generative grammar to determine rule ordering, Patañjali's proposal weakens the grammar. It would be circular for knowledge of correct speech forms to be required in order to comprehend what the grammar provided since the grammar is meant to validate correct speech forms.

However, it is not necessarily the case that Pāṇini's grammar was intended to function in total independence from the guidance of those who know what constitutes correct Sanskrit usage. As a matter of fact, later grammarians criticize those who are single-minded in finding solutions to make the grammar operate entirely by rule. Nāgeśa uses the term *lakṣaṇaikacakṣuṣka* `rule-one-eyed', i.e. `for whom the rules are their only eye', in a derogatory manner for such people; they do not know the correct forms to be described by the rules (*lakṣya*) without depending upon the rules (*lakṣaṇa*).

subsubsection{Interpretation and indeterminate variation}
10.2.7.3   Interpretation and indeterminate variation

Pāṇini himself formulated certain rules in such a way as to leave the grammar open-ended. Section xxxxxref{architecture} [[[10.2.2]]] noted that certain basic elements are unlimited: nominal bases are included as basic elements under the sole specification that they be meaningful (*A.* 1.2.45). Verbal roots are also unlimited since rules are included that derive verbal roots from nominal bases specified by general criteria (*A.* 3.1.8-11 et alia). Likewise, Pāṇini formulates numerous escape rules. Some of these, such as *A.* 3.2.101 *anyeṣv api dṛśyate*, state that affixes provided in specified circumstances ``are seen in others as well" or similarly state that those provided after specific roots ``are seen after others as well", for example *A.* 3.2.178 *anyebhyo 'pi dṛśyate*. Others state that there is transgression of certain previously stated rules with indeterminate variation, such as *A.* 3.1.85 *vyatyayo bahulam*. In some cases, such as regarding Vedic forms, deference may be made to other treatises that deal with the phenomena in greater specificity. Yet in other cases it may be that Pāṇini deliberately leaves room for productive processes and free variation in usage (see Cardona 2004).

subsubsection{Limits of analysis}
10.2.7.4   Limits of analysis

Unlike Śākaṭāyana and the etymologists who considered that all words were derivable from verbal roots (see section xxxxxref{nirukta} [[[10.1.2]]]), most grammarians recognized that some nominal forms are opaque to linguistic analysis and must be included in the lexicon anomalously. *A.* 1.2.53 *tad aśiṣyaṃ sañjñāpramāṇatvāt* considers that anomalies of gender and number agreement for certain derivates such as fruit and place names are not to be taught as inherited from their derivational bases because these anomalies are understood by convention. Two subsequent rules, *A.* 1.2.54-55, eschew the derivation of such fruit and place names altogether; such words are to be included in the lexicon as independent underived conventional terms. *A.* 1.2.53, which though possibly an interpolation was part of the *Aṣṭādhyāyī* text received by Patañjali, and *A.* 1.2.54-57, which are commented upon by Jayāditya and Vāmana in the *Kāśikā* yet are very likely interpolations since they are not commented upon by Kātyāyana or Patañjali, are critical of the policy of deriving such conventional terms actually carried out in the *Aṣṭādhyāyī*. On the other hand, the *Aṣṭādhyāyī* contains numerous rules that derive conventional

terms while insufficiently specifying their limited scope of application.   Kātyāyana and Patañjali frequently defend such rules from charges of overextension by arguing that unwanted application of such rules is prevented by virtue of the fact that unwanted derivates simply happen not to be used to signify the given meaning (*anabhidhānāt*) (*A.* 3.2.1 vt. 5, *MBh.* 2.94.15).   Indeed one of the impressive features of Pāṇinian grammar is the deep lexical penetration of its systematic derivation.

section{Non-Pāṇinian Sanskrit grammar}
10.3   Non-Paninian Sanskrit grammar
label{sktgram}
subsection{Rules}
10.3.1 Rules

Even though they depend upon Pāṇini's work, a number of grammatical treatises are called non-Pāṇinian because they depart from his techniques in significant ways.   The earliest such grammar known, by Kumāra-lāta c.~325 textsc{ce}, is extant only in a single fragmentary manuscript discovered in Turkestan.   Kumāra-lāta permits Middle Indo-Aryan forms commonly found in Buddhist scriptures (Scharfe 1977: 162).   Perhaps the oldest extant, but of uncertain date, is the *Śabdakalāpa* grammar of Kāsa-kṛtsna.   A shorter version of the *Śabdakalāpa* is found in the *Kātantra* grammar of Śarva-varman (c.~400 textsc{ce}) which itself was enlarged (c.~800 textsc{ce}) in Tibetan Tanjur.   The grammar is less analytic and derivational than Pāṇini's in that, for example, it provides ready-made a full set of verbal terminations for the various tenses and moods rather than deriving them from basic terminations by substitution and augmentation.   The description of phonetic change and the arrangement of the sound catalogue follow the Prāti-śākhyas rather than the Pāṇinian description of speech form substitution and the Pāṇinian rearrangement of the sound catalogue for the purpose of forming abbreviatory terms of phonetic reference (see xxxxxref{reference} [[[10.2.3]]]).   Śarva-varman's *Kātantra* grammar originally did not include sections devoted to deriving primary nominal derivates, secondary nominal derivates, and compounds.   While such simplifications have often been considered to be solely for pedagogical purposes, they are motivated by a theoretical concern that has a long history: conventional terms are considered underivable (see Cardona 2008); they are to be included in an enlarged lexicon as opaque to derivation just as underived stems are included among basic elements in Pāṇinian grammar and just as verbal roots constitute the lexicon in the view of Śākaṭāyana and the etymologists.

The *Cāndra* grammar of the Buddhist Candra-gomin (fifth century textsc{ce}) avoids technical terms and dispenses with Pāṇini's kāraka class names.   The *Jainendra* grammar of the Jain Deva-nandin (c.~fifth-seventh century textsc{ce}) closely follows the sequence of Pāṇini's rules while further condensing their formulation.   The *Mugdhabodha* of Vopa-deva (late thirteenth century textsc{ce}, Maharashtra) similarly condenses rule-formulation in a set of 1184 sūtras in 26 sections.   The rule set and commentary *Amoghavṛtti* of the Jain monk Śākaṭāyana (ninth century textsc{ce}) are the foundation of the *Siddhahaimacandra* of the Jain Hema-candra Sūri (1089-1172 textsc{ce} Gujarat).   A quarter of the 4,500 rules of the latter are transfer rules in the eighth book that derive Prakrit from Sanskrit basic forms (Scharfe 1977: 169).   In 1042, Bhoja, king of Dhārā in western Madhya Pradesh incorporated Kātyāyana's vārttikas, metarules, and other grammatical components in his *Sarasvatīkaṇṭhābharaṇa* grammar of more than 6,000

rules in a topical arrangement commented upon in the *Hṛdayahāriṇī* by Nārāyaṇa-bhaṭṭa. In the twelfth century Kramad-īśvara wrote the *Saṃkṣiptasāra* arranged topically in 4,000 sūtras on which Jūmara-nandin (thirteenth century) wrote the *Rasavatī*. In the first half of the twelfth century in Varanasi, Dāmodara wrote a grammar in 50 kārikās in Ārya meter arranged in five chapters that shows the relationship of Old Kosalī to Sanskrit. The last two chapters are devoted to letter writing. The Sārasvata grammar, extant in Anubhūti-svarūpācārya's (thirteenth-fourteenth centuries) *Sārasvataprakriyā* in 1494 sūtras, generated a number of commentaries. In Mithila and Cooch in Bihar, Padma-nābha-datta (fourteenth century) and Puruṣottama (sixteenth century) wrote the *Saupadma* and *Prayogaratnamālā* grammars.

subsection{Root lists (*dhātupāṭha*s)}
10.3.2 Root lists (*dhātupāṭha*s)

As in Pāṇinian grammar, a root list is an essential component of other Indian linguistic systems; hence root lists accompany the rule sets composed by other linguists. The *Śabdakalāpa* grammar of Kāsa-kṛtsna includes a root list on which Canna-vīra-kavi (c.~1500 textsc{ce}, Kuṇṭikā-pura, Tumkur district, Karṇātaka) wrote a Kannada commentary *Kāśakṛtsna-śabdakalāpadhātupāṭhakarṇātakaṭīkā*. The enlarged version of the *Kātantra* grammar was supplied with a root list. While the root lists associated with these grammars share a large common stock, each root list differs from that attached to other grammars by the addition, omission, alternative classification, and modification of roots in the list. Variation in the root list alters the linguistic description of the linguistic system that includes the root list. Roots may have been deliberately added by linguists or redactors to their root list in order to account for forms in the Sanskrit language as known to them. Such roots would account for new words not known to Pāṇini, or to other early grammarians, that may have come into Sanskrit due to historical sound change and from borrowings into Sanskrit from regional and foreign languages throughout the history of Sanskrit's presence in the sub-continent. In addition to sound change and borrowing, the linguistic process of analogy created new verb forms in Sanskrit to be accounted for by reclassification of roots within the root lists.

section{Grammars of languages other than Sanskrit}
10.4   Grammars of languages other than Sanskrit

subsection{Prakrit Grammars}
10.4.1 Prakrit Grammars

The Bharata-*Nāṭyaśāstra* (written by the early centuries textsc{ce}) contains a few verses written in Prakrit (17.6-9) that state phonetic rules to convert Sanskrit to Prakrit exemplified in subsequent verses written in Sanskrit (17.10-23). The *Prākṛtaprakāśa*, attributed to Vara-ruci, consists of 420 sūtras dealing with Mahā-rāṣṭrī. The text was commented upon in the seventh century by Bhāmaha who adds a chapter on Paiśācī and a chapter on Māgadhī. A chapter on Śaura-senī was subsequently added. The grammar derives the Prakrit forms from strings of basic Pāṇinian grammatical elements in Sanskrit. Expansions of the text attributed to Vara-ruci include Puruṣottama's (twelfth century) *Prākṛtānuśāsana*, Mārlaṇḍeya's *Prākṛtasarvasva* (seventeenth century), and Rāma-śarman's (seventeenth century) *Prākṛtakalpataru*, which add treatment of Paiśācī and Apabhraṃśa. Hema-candra Sūri composed 1119 rules that similarly

derive these Prakrits and Ardha-māgadhī from Sanskrit basic elements in the eighth book of his Sanskrit grammar (see section xxxxxref{sktgram} [[[10.3]]]). Kramad-īśvara likewise included a treatment of Prakrit in the eighth book of his Sanskrit grammar (see xxxxxref{sktgram} [[[10.3]]]). The *Prākṛtaśabdānuśāsana* of the Jain Tri-vikrama (thirteenth century) in 1036 sūtras depends heavily upon the work of Hema-candra Sūri.

subsection{Pāli}
10.4.2 Pāli

The oldest extant Pāli grammar is the *Kaccāyanavyākaraṇa* written between the fifth and eleventh centuries in Pāli in 675 sūtras and commented upon first in the eleventh century in the *Nyāsa* by Vimala-buddhi.   Its most prominent recast is the *Rūpasiddhi* of Buddhappiya dīpaṃ-kara (late thirteenth century).   In 1154 in Pagan, Agga-vaṃsa composed the *Saddanīti* which drew upon the Sanskrit grammars of Kramad-īśvara, Maitreya-rakṣita, and Kaccāyana. During the reign of Parakkama-bāhu I (1153-1186), Moggallāna of the Thūpā-rāma monastery in Anurādha-pura wrote the *Māgadha saddalakkhaṇa*, influenced by the work of Candra-gomin, which inspired a large body of grammatical literature.   While these grammars were influenced in their techniques by the Sanskrit grammars, they do not derive Pāli forms from Sanskrit as do the Prakrit grammars.

subsection{Persian}
10.4.3 Persian

Kṛṣṇa-dāsa wrote a grammar and glossary of Persian called *Pārasīprakāśa* under commission from the Moghul emperor Akbar who ruled 1556-1605.   The grammar, written in Sanskrit in 480 rules, derives Persion from Sanskrit basic elements.

subsection{Tamil}
10.4.4 Tamil

The Sangam literature in Tamil comprises about 2,300 poems constituting about 29,300 lines arranged in eight anthologies composed over a long period of time in part in the early centuries textsc{ce} while the names of kings mentioned in some of them appear in inscriptions of the third century B.C.   Composed no earlier than the second century B.C. and reaching the form in which it has been received in the fifth century textsc{ce}, the oldest Tamil linguistic treatise, the *Tolkāppiyam* consists of 1600 verses in three books, each containing nine chapters, covering three topics: phonetics, words, and poetic subject matter.   The text was commented upon in full by Iḷampūraṇar (tenth-twelfth centuries) and in part by C=ebNāvaraiyar (thirteenth-fourteenth centuries), P=erāciriyar (thirteenth century), NaccibNārkkinbNiyar (fourteenth century), Teyvaccilaiyār (c.~sixteenth century), KallāṭabNār (c.~fifteenth-seventeenth centuries), and a later anonymous commentator.   The language it describes differs only in minor respects from that of the Sangam literature.   The first book includes graphic considerations in writing as well as phonetics, phonology, sandhi, and morphophonemics.   The second book treats of morphology and syntax, especially case.   While inspired by Pāṇinian kārakas, it utilizes exclusively Tamil terminology and adds two additional categories: time and purpose.   It also treats the syntax of particles.   The third book describes the conventions of amorous and martial poetry, sentiments,

analogy, and metrics---topics found in Sanskrit literary theory texts.   The composition of the *Tolkāppiyam* borrows from the Sanskrit phonetic, grammatical, and poetic traditions but does not adopt Pāṇinian techniques.   Like the Prāti-śākhyas, phonetic rules are framed in terms of change rather than substitution (as in Pāṇinian grammar), and accounting is made of permitted phonetic sequences and occurrence of sounds in initial and final position in words.

Of the *Avinayam* handbook composed before the ninth century only fragments remain.   The *Vīrac\=o\bLiyakkārikai*, written by the Buddhist king Putta-mittirabN in the eleventh century, consists of 181 verses in five chapters covering five topics: phonetics, word, poetic subject matter, metrics, and poetics.   The text introduces some Pāṇinian terminology and techniques such as the kārakas and zero suffixes.   The text was commented upon soon afterwards by Perunt=evabNār.   The Jain Kuṇa-vīira-paṇṭitar wrote the *N\=eminātam* at the beginning of the thirteenth century.   The text consists of 95 verses in two sections: phonetics and word.   At about the same time, the Jain Pavaṇanti wrote the *Na\b{nn}ūl* consisting of 462 verses in three sections, including a preface in 55 verses which may be a later addition, and sections on phonetics and word.   The text was first commented upon by Mayilaiṇātar in the fourteenth century.   In the beginning of the seventeenth century Cuppiramaṇiya-tīṭcitar wrote the *Piray\=okaviv\=ekam*, and towards the end of the same century Vaittiyaṇāta nāvalar wrote the *Ilakkaṇaviḷakkam*.

The *Līlātilakam* (1375-1400 textsc{ce}) is a grammar of Tamil consisting of 151 sūtras in Sanskrit with a commentary in Malayalam concerning a style that mixes Sanskrit with a vernacular language called *maṇipravāḷam* `jewel and coral'.   The text describes the phonetics and grammar of each language while disapproving of the use of Sanskrit terminations for Tamil words and vice versa.   Chevillard (2000) supplies more detail about Dravidian linguistics.

subsection{Telugu}
10.4.5 Telugu

The *Āndhraśabdacintāmaṇi* in 82-90 verses containing 274 sūtras in Sanskrit ascribed to the poet Nannaya (eleventh century) was commented upon in Telugu by Elakūci bāla-sarasvatiī (c.~1550-1600), Appakavi (c.~1600-1670), and Aho-bala-pati (c.~1700).   Yet Mūlaghaṭika ketana (1220-1300) claimed that his *Āndhrabhāṣābhūṣaṇa* in 192 Telugu verses was the first Telugu grammar.   In the beginning of the fourteenth century, Atharvaṇācārya composed the *Vikṛtiviveka*, a supplement to the *Āndhraśabdacintāmaṇi* in Sanskrit, and the *Triliṅga-śabdānuśāsana*, an essay on the origin of the Telugu language.   In the nineteenth century, following the arrangement of Bhaṭṭoji-dīkṣita's *Siddhāntakaumudī*, Paravastu cinnayasūri wrote his influential *Bālavyākaraṇamu* in Telugu sūtras to which B. Sītā-rāmācāryulu wrote a supplement replete with examples, the *Prauḍhavyākaraṇamu*, published in 1885.

subsection{Kannada}
10.4.6 Kannada

Nāga-varma (c.~1150) wrote the *Śabdasmṛti* in 96 verses in Old Kannada as part of his literary manual *Kāvyālocana*, and an independent work, the *Karṇāṭakabhāṣābhūṣaṇa* in 280 sūtras in ten sections with a commentary in Sanskrit.   In the thirteenth century, Keśi-rāja wrote a

comprehensive grammar, the *Śabdamaṇidarpaṇa*, in Old Kannada in 322 metrical sūtras with a commentary.   In 1604, Bhaṭṭākaḷanka deva wrote the *Karṇāṭakaśabdānuśāsana* in 592 sūtras with commentary in Sanskrit, often quoting the *Jainendra* grammar (see section xxxxxref{sktgram} [[[10.3]]]).

section{Semantics}
10.5.   Semantics
subsection{Literature}
10.5.1 Literature

Bhartṛ-hari's (fifth c. textsc{ce}) *Vākyapadīya*, which derives much of its substance from the semantic discussions in Patañjali's *Mahābhāṣya*, exerted a wide and lasting influence.   The three major parts of the *Vākyapadīya* were the subject of commentaries: the *Vṛtti* on the *Brahmakāṇḍa*, debatably by Bhartṛ-hari himself, on which Vṛṣabha-deva (post tenth century?) wrote the *Paddhati*; Puṇya-rāja's *Ṭīkā* (post tenth century?) on the *Vākyakāṇḍa*; and Helā-rāja's *Prakāśa* (tenth century) on the extensive *Padakāṇḍa* which consists of fourteen sections.   The more recent works on semantics of Kauṇḍa-bhaṭṭa (seventeenth century) and Nāgeśa (late seventeenth-eighteenth century) are heavily indebted to the *Vākyapadīya*.   Kauṇḍa-bhaṭṭa's compositions include the *Vaiyākaraṇabhūṣaṇa* and its abridgement the *Vaiyākaraṇabhūṣaṇa-sāra*.   Nāgeśa wrote the *Vaiyākaraṇasiddhāntamañjuṣā* and two abridgements to it: the *Laghu-mañjuṣā* and the *Paramalaghumañjuṣā*.

At least two other major systems of philosophy are concerned with semantic analysis: Nyāya `logic' and Karma-mīmāṃsā `ritual exegesis'.   It is not possible to survey the massive literature produced in these philosophical traditions here, but their foundations will be briefly mentioned. Gautama's *Nyāyasūtra*s, codified perhaps in the second century textsc{ce}, and Vātsyāyana's commentary on them, written in the early fifth century textsc{ce}, are the foundation of the Nyāya system.   The most important ancient commentary to follow is Uddyota-kara's *Nyāya-vārttika* written at the end of the sixth or beginning of the seventh century textsc{ce}. Vācaspati-miśra wrote his *Tātparyaṭīkā* commentary on the *Nyāyavārttika* in the tenth century. An independent work differentiating the views of Nyāya from Buddhism and Karma-mīmāṃsā is the *Nyāyamañjarī* of Jayanta-bhaṭṭa (c.~900).   In the eleventh century, the *Kiraṇāvalī* by Udayana, a commentary on Praśasta-pāda's *Padārthadharmasaṅgraha* (c.~550), begins the unification of Nyāya and the philosophical school concerned primarily with ontology called Vaiśeṣika.   Central in establishing the new Nyāya ({Navya-nyāya}) is Gaṅgeśa (c.~1320), the author of the *Tattvacintāmaṇi*.

As would be expected for those concerned with the analysis and interpretation of statements and injunctions in ritual texts, semantics is a major concern in the tradition known as Karma-mīmāṃsā.   Growing out of a long tradition of Vedic exegesis and performance, the *Pūrvamīmāṃsāsutra*s were codified in about the second century B.C., although they may have reached their final form somewhat later.   They are attributed to Jaimini but the names of both him and Bādarāyaṇa, to whom the *Uttaramīmāṃsāsutra*s are attributed, are mentioned in particular sūtras.   In the fourth or fifth century textsc{ce}, Śabara composed his *Bhāṣya* commentary on the *Pūrvamīmāṃsāsutra*s.   This is the most ancient commentary extant on them, but Śabara mentions predecessors and cites a long passage from one Vṛtti-kāra in his

commentary on 1.1.5.   Śabara is followed by Kumarila, Prabhā-kara, and Maṇḍana-miśra in the seventh century.   Kumarila has been the most influential of the three, but each of them had his distinct ideas and gave rise to long and active independent traditions.

Subramania Iyer (1969) provides an extensive summary of the thought presented by Bhartṛ-hari in his *Vākyapadīya*, while Houben (1995) translates an important chapter, discusses principles for its interpretation, and provides access to recent work on this central figure of Indian philosophy of language.   Kunjunni Raja (1963) gives a clear presentation of the major points of view in Indian semantics, while Bhattacharya (1962) is more textually oriented and Biardeau (1964) is more interpretive.   Scharf (1996) and Aussant (2009) enter into the details of argumentation concerning the semantics of common and proper nouns respectively.

subsection{Issues}
10.5.2 Issues

Sanskrit grammarians begin from the conception of speakers and end with speech.   They all, from the ancient phonetic treatises proper to particular Vedic traditions ({Prāti-śākhya}s; see section xxxxxref{phonetics} [[[10.1.3]]]) to medieval non-Pāṇinian grammars (section xxxxxref{sktgram} [[[10.3]]]) and early modern reworkings of Pāṇinian grammars (section xxxxxref{litrules} [[[10.2.1.1]]]), derive actual speech from basic elements previously abstracted in accordance with an assumed prior analysis.   The rules, constructed from the point of view of the speaker rather than of the listener, generate speech forms under semantic as well as coocurrence conditions.   Indian semantic treatises, however, based upon an analysis of the implications of generative rules, determine the cognition produced from the comprehension of speech forms from the point of view of a listener.   They investigate the verbal cognition (*śābda-bodha*) produced by sentences, words, and basic grammatical constituents.

Among the principal questions investigated are the status and segmentation of the speech form that conveys meaning.   Bhartṛ-hari considers that what conveys meaning is in fact the sentence itself manifested by articulated sounds but cognized in the awareness of the listener as an indivisible whole (*akhaṇḍavākyaspoṭa*), that the meaning it conveys is likewise an indivisible whole insight (*pratibhā*), and that segmentation into words and basic elements is merely posited artificially (*kalpita*) as a convenient means to describe correct usage.   Knowledge of correct usage leads to insight into the undifferentiated level of speech that is the ultimate reality (*brahman*) and source of differentiation in the world.   The Karma-mīmāṃsā philosopher Kumarila, on the other hand, considers that individual speech units directly cause the recall of meanings which the listener then synthesizes into cognition of the meaning of the sentence (*abhihitānvaya*).   Between these views is that of another Karma-mīmāṃsā philosopher Prabhā-kara who considers that words convey meaning only after they have been cognized in syntactic constructions (*anvitābhidhāna*).

Another principal topic of debate is what the principal element is in the verbal cognition of a sentence.   Nyāya philosphers consider the entity denoted by the nominative to be the principal element and to be qualified by the action denoted by the verb.   Grammarians, on the other hand, consider the action to be principal and to be qualified by various participants in it, including the agent denoted by the nominative in an active construction.   The action itself was analyzed to

consist of two parts: behavior itself (*vyāpāra*) and its result (*phala*).   The ritual exegete Kumarila considered that just the former, called the act of bringing about (*bhāvanā*), is denoted by the verbal termination and is the principal element of cognition in Vedic injunctions to perform ritual acts.

Other topics of debate include the denotation of common nouns and proper names; the nature of denoted items such as generic properties, substances, qualities, gender and number, time, and action; the nature of the primary denoting relation, secondary relations, suggestion, and purport; whether the relation between speech forms and their meanings is natural or conventional; and how such relations are established and learned.   Important considerations in the last mentioned topic are avoiding infinite regress and deviation.   For instance, it is argued that a common noun must denote a generic property rather than particular individuals because a single invariant relation can be established with the former but not with the latter.   Opposing views argue that a generic property can act as a handle without actually entering the cognition produced or can enter the cognition as a qualifier rather than the principal qualificand.   These discussions produced a voluminous literature that included the fields of literary criticism and artistic appreciation as well as the disciplines already mentioned, and the topics continue to be debated in circles of traditional Indian learning.

begin{table}
caption{Components of Pāṇini's grammar [[[10.1]]]}
label{table-components}
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begin{tabular}{llll}

rules	**metarules**	**lexical lists**	**phonological list**
Aṣṭādhyāyī	metarules	dhātu-pāṭha	akṣara-sam-ā-mnāya
Uṇādisūtra	paribhāṣā-sūtras	gaṇa-pāṭha	

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begin{landscape}
begin{table}
caption{{Pāṇini}an derivation [[[10.2]]]}
label{table-derivation}
medskip
begin{tabular}{lll}
1. & Theodore cooks &
2. & *devadatta*[masculine, one, independent actor] *pac*[present time] &
3. & *devadatta*[masculine, one, kartṛ] *pac*[present time] & *A. 1.4.54 svatantraḥ kartā*
4. & *devadatta*[masculine, one, kartṛ] *pac-l* & *A. 3.2.123 vartamāne laṭ*
5. & *devadatta*[masculine, one, kartṛ] *pac-ti* & *A. 3.4.78 tiptasjhi\ldots*
5a. &   & *A. 1.3.78 śeṣāt kartari parasmaipadam*
5b. &   & *A. 1.4.22 dvyekayor dvivacanaikavacane*
5c. &   & *A. 1.4.108 śeṣe prathamaḥ*
6. & *devadatta*[masculine, one, kartṛ] (*pac-a*)-*ti* & *A. 3.1.8 kartari śap*
7. & *devadatta-s* (*pac-a*)-*ti* & *A. 4.1.2 svaujhas\ldots*

7a. &   & A. 1.4.22 *dvyekayor dvivacanaikavacane*
7b. &   & A. 2.3.46 *prātipadikārthaliṅgaparimāṇavacanamātre prathamā*
8. & *devadatta-s*[pada] (*pac-a*)-*ti*[pada] & A. 1.4.14 *suptiṅantam padam*
9. & *devadatta-ru*[pada] (*pac-a*)-*ti*[pada] & A. 8.2.66 *sasajuṣo ruḥ* (*padasya* 8.1.16)
10. & *devadattaḥ pacati* & A. 8.3.15 *kharavasānayor visarjanīyaḥ* (*padasya* 8.1.16)
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begin{table}
caption{{Pāṇini}'s sound catalogue: *Pratyāhārasūtra*s [[[10.3]]]}
label{table-pratyahara}
medskip
begin{tabular}{lll}
1. & *a i uṇ*
2. & *ṛ ḷk*
3. & *e oṅ*
4. & *ai auc*
5. & *ha ya va raṭ*
6. & *laṇ*
7. & *ña ma ṅa ṇa nam*
8. & *jha bhañ*
9. & *gha ḍha dhaṣ*
10. & *ja ba ga ḍa daś*
11. & *kha pha cha ṭha tha ca ṭa tav*
12. & *ka pay*
13. & *śa ṣa sar*
14. & *hal*
end{tabular}
end{table}

begin{table}
caption{Rule types in Pāṇini's *Aṣṭādhyāyī* [[[10.4]]]}
label{table-ruletypes}
medskip
begin{tabular}{lll}
1. & introduction of a technical term (*sañjñā*)
2. & metarule (*paribhāṣā*)
3. & provision (*vidhi*)
4. & restriction (*niyama*)
5. & extension (*atideśa*)
6. & heading (*adhikāra*)
7. & negation (*niṣedha*)
end{tabular}
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begin{table}
caption{Pronominal variables in taddhita-affixation [[[10.5]]]}
label{table-taddhita}
medskip
begin{tabular}{lll}
A. 4.2.59 *tad adhīte tad veda* & *vyākaraṇam adhīte* & *vaiyākaraṇaḥ*
  & `studies grammar' & `grammarian'
A. 4.2.1 *tena raktaṃ rāgāt* & *kaṣāyena raktaṃ* & *kāṣāyam*
  & `dyed with ochre' & `an ochre robe'
A. 5.1.5 *tasmai hitam* & *vatsebhyo hitaḥ* & *vatsīyaḥ*
  & `good for calves' & `a milkman good for calves'
A. 4.3.74 *tata āgataḥ* & *srughnād āgataḥ* & *sraughnaḥ*
  & `come from Srughna' & `Srughnan'
A. 4.1.92 *tasyāpatyam* & *upagor apatyam* & *aupagavaḥ*
  & `descendant of Upagu'
A. 4.3.25 *tatra jātaḥ* & *srughne jātaḥ* & *sraughnaḥ*
  & `born in Srughna' & `Srughnan'
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begin{table}
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caption{General Pāṇinian kāraka rules [[[10.6]]]}
label{table-karaka}
medskip
begin{tabular}{l|l|l|l|l}
sūtra & **kāraka** & **semantic condition** & **vibhakti** & **sūtra**
A. 1.4.24 & *apādāna* & fixed point of departure & 5th & *A.* 2.3.28
A. 1.4.32 & *sampradāna* & intended recipient of the object & 4th & *A.* 2.3.13
A. 1.4.42 & *karaṇa* & immediately most efficacious & 3rd & *A.* 2.3.18
A. 1.4.45 & *adhikaraṇa* & substrate & 7th & *A.* 2.3.36
A. 1.4.49 & *karman* & most desired to be attained & 2nd & *A.* 2.3.2
A. 1.4.54 & *kartṛ* & independent & 3rd & *A.* 2.3.18
A. 1.4.55 & *hetu* & agent's motivator &   &
end{tabular}
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begin{table}
caption{Partial Indic language Romanization key [[[10.7]]]}
label{table-phonetickey}
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begin{center}

begin{tabular}{cc}
ISO 15919 & **IPA**
=a & textlengthmark
={i} & itextlengthmark
=u & utextlengthmark
textsubring{r} & textsyllabic{textturnrrtail}
textsubring{l} & textsyllabic{l}
.n & textipa{N}
~n & textltailn
d{t} & textrtailt
d{t}h & super{h}
d{d} & textrtaild
d{l} & textrtailr
d{d}h & super{h}
d{n} & textrtailn
's & c{c}
d{s} & textrtails
d{h} & h
textsubbar{h} & x
textsubwedge{h} & textphi
.m & nasal fricative
\bL & textrtaill~(Tamil)   %central retroflex approximant with lateral contact between the sides of the mid-tongue and the palate
\bR & textrtailr~(Tamil)   %non-lateral post-alveolar
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