CHAPTER- V

INDIAN THEORIES OF MEANING IN THE LIGHT OF

MODERN LINGUISTICS

THE TOWER OF BABEL

‘And the whole earth was of one language, and of one speech. And it came to pass, as they journeyed from the east, that they found a plain in the land of Shinar; and they dwelt there. And they said one to another, Go to, let us make brick, and burn them thoroughly. And they had brick for stone, and slime had they for mortar. And they said, Go to, let us build us a city and a tower, whose top may reach unto heaven; and let us make us a name, lest we be scattered abroad upon the face of the whole earth. And the Lord came down to see the city and the tower, which the children of
men builded. And the Lord said, Behold, the people is one, and they have all one language; and this they begin to do: and now nothing will be restrained from them, which they have imagined to do. Go to, let us go down, and there confound their language, that they may not understand one another’s speech. So the Lord scattered them abroad from thence upon the face of all the earth: and they left off to build the city. Therefore is the name of it called Babel; because the Lord did there confound the language of all the earth: and from thence did the Lord scatter them abroad upon the face of all the earth’. (Genesis 11:1-9)

This is a beautiful story narrated in the Bible about the varieties of languages spread over the earth. God, who saw that if united, nothing is impossible for man, stole his language and made him weaponless. Thus arisen the different languages of the world. Whether the story from Bible is truth or myth, it is a fact that the distinct languages spoken by different people are somewhere related
to each other. This unity in diversity of the languages became the fuel for the advancement in linguistics.

When our ancestors entered the cultivation and construction fields they took special care to enrich their expertise by keen observations. Thus the controlled use of the hands might have contributed to the enrichment of another ability that is the modulation of sound which led to the development of the oral expressions. It has been proved that the movement of hands results in corresponding facial movements. The practice of communication by jesters might have resulted in modulation of sound.

**Language Study in the West**

As noted in the first chapter, in the West it was the Greek who pioneered the study of languages. Herodotus of 5\textsuperscript{th} century B.C. tells the story of a king who experimented with two newborn babies brought up in a park isolated from outside world to
see what they spoke. In the Dialogue, Plato also discusses the origin of words and their relation to the objects they refer to.

The interest shown by the humanists of the renaissance period in the languages and literature of their ancestors was highly significant. By this time Greek and Latin had influenced almost all European languages to some extent. Deep knowledge of grammar and structure is essential for the study of an ancient language. The enthusiastic teachers of those days were attracted to the efficient means for language teaching. This paved the way for the enquiry of meaningful rules and theories of language, which resulted in the rich literature on this subject. By 16th century when regional languages also attracted attention, the role of ancient languages got restricted as mere subject for language studies. In the case of the French Benedictines of 17th century the ancient languages gave way to the middle age Latin and Byzantine Greek which were nurtured by the humanists as a mixed language.
From the dusk of 15th century the studies of grammar, phonetics, and pronunciations of many regional languages had started. Even though many dictionaries were published in 17th and 18th centuries, the branch of morphology was not sufficiently developed. The main reason for this was the absence of comparative linguistics of Indo-European languages, even though some scholarly attempts were started by that time. From the period of renaissance the number of bilingual dictionaries had increased. Translation also was accepted as a literally activity by this time. Without considering the likes or dislikes of authorities including state, commerce and religion, scholars undertook serious comparative studies of different languages. During 1300s though Greek literature was a source of western culture, the interest in the study of that language was hardly visible. But by 1500 the study of Greek became common and by the next century the Hebrew language became a medium for scholarly discourses. Moreover Arabic which was popular among the
Christians of Spain became a subject of study of scholars in other parts of Europe also. The first attempt in comparative linguistics was due to Gesner Conrad in his book Mithridates (1555 C.E). But he was unaware of Sanskrit language. It was later Filippo Sassetti (1540 to 88 C.E.) who, while visiting India put forward a hypothesis that Sanskrit and European languages are related based on a study of comparable roots and words. It is this hypothesis which was described with more detailed proofs by the Jesuit missionary-Gaston-Laurent Coeurdou(1691-1779) in his Memoire to the ‘Academy of Sciences (France) in 1767. This marked the beginning of extensive studies of regional languages both west and east. In the multy-lingual dictionary- Lingaurum Trotius Obis Vocabularies Comparativa prepared at the instance of Lady Katherine was included around 200 languages. Later the Spanish linguist Lorenzo Hervas Y Pandora in his Catelogo de las Lenguas de las Naciones Conocidas(1800-1805) had studied 300 languages and it was followed by ‘Mythridates’ by
Jogan Christov Asylung which dealt with 500 languages. All these show the influence of regional European languages among the scholars. In addition to these, the great voyages in 14-15 centuries resulted in creating interest in the study of different cultures.

**Indo-European Languages**

An epoch making speech by Sir William Jones is considered as the discovery of Sanskrit by the West. In his address to the Asiatic Society, Calcutta on February 2, 1786\(^1\), he declared:

“The Sanskrit language, whatever be its antiquity is, of a wonderful structure; more perfect than the Greek, more copious than the Latin and more exquisitely refined than either; yet bearing in the roots of verbs and in the forms of grammar than could possibly have been produced by accident; so strong indeed that no philosopher could examine them all three without believing them to

---

\(^1\) Asiatic Research, Vol.1, 1788, pp.422f
have sprung from some common source which, perhaps, no longer exists; there is similar reason, though not quite so forceful, for supposing that both the Gothic and the Celtic, though blended with a different idiom, have the same origin with the Sanskrit; and the old Persian might be added to the same family."

Although some studies were there from 16th century as mentioned earlier, this statement of Sir William Jones is considered as the starting point of comparative linguistics of the Indo-European languages. In addition to the foundation of the Asiatic Society, the contributions of this Judge of the Supreme Court of India include a translation of Kālidāsa’s Śākuntalam into English.

The bicentennial of this translation was officially celebrated in the year 1990 as the Sanskrit year. He also made the conjecture that Sandra Cottos of the ancient Greek writers was Chandragupta Maurya of the Purāṇās, which has acted as a
hypothesis for the study of ancient Indian history and chronology.

Thus Sanskrit is one of the most important languages of the Indo-European family having a very rich heritage of nearly 5000 years. The in depth comparative studies of the various languages like Sanskrit, Old Persian, Greek, Latin, German and English during the first half of 19th century has shown that all these languages sprang from a common source known as Proto-Indo-European (PIE). It is generally believed that this source is located somewhere in Eastern Europe, north of Black sea and western Asia and the ancestral language might have resembled some of its more archaic descendents such as Greek and Latin somewhat closely.

Based on the close resemblances between the Aversion language and the Vedic Sanskrit, it is inferred that the forefathers of the Vedic Aryans and the Iranians belonged to some common race. Thus the history of the evolution of Sanskrit is to be translated through the old Indo-Iranian heredity. It is also assumed
that nomadic bands of Aryans migrated to India through the north-west passes in successive waves. The Sanskrit language preserves many of the ancient features of PIE in phonology and morphology. It has served as a link language not only within India but in the south-east Asian countries as a whole. Though it was a polished language of elite Brāhmins, its influence on modern Indian languages and even on foreign languages is astounding. It was propagated throughout the main land of Asia up to Japan and China by the Buddhists.

While Sanskrit is a polished language its unpolished variants were existent with various peculiarities on the basis of geographical locations. The first epigraphic documents are available to us through the Aśoka’s inscription of the third century B.C. Sanskrit gradually replaced the Prākrit and the first Sanskrit inscription is that of Rudradaman of second century A.D. While ‘Vocanh’ inscription in Sanskrit is found in Indochina no Prākrit inscription could be located outside India. In India, inscriptions in
mixed Sanskrit and Prākrit have been located and Buddhist literature in hybrid-Sanskrit is also found out. While Pāli was the special language of Hīnayāna Buddhism and Ardhamāgadhī of Jainism, Sanskrit was that of Mahāyāna Buddhists.

The Chinese traveler It -zing in the seventh century studied Sanskrit at Palembang in Sumatra on his way to India. Sanskrit manuscripts were spread to central Asia and Tibet. Pāṇini’s grammar, Daṇḍin’s Kāvyādarśa and the Aṣṭāṅgahrdaya were translated to Tibet and Mongolian languages and were taught there. Sanskrit inscriptions of Cambodia are in kāvyā style and rich and vast. The importance of Sanskrit literature goes far beyond their aesthetic value. It is the key to the study of Indian civilization. An astonishing feature of Indian cultural inheritance is unbroken continuity through centuries spread over nearly 5000 years. It existed not in isolation and had continuous and timely contact with Babylonians, Iranians, Greeks, Egyptians, Chinese and Arabs,
absorbing and assimilating the best from their civilizations and enriching its own.

**Aspects of Languages**

Some special aspects of human languages are duality, productivity, arbitrariness, interchangeability, specialization and cultural transmission. Though precisely stated in modern linguistics, these were known to the early Indian scholars also.

a) **Duality**

Language can be viewed in two ways – as a group of phonemes or as different combinations of roots and suffixes. Roots and suffixes are meaningful factors formed by the combination of one or more phonemes. This duality helps to create thousands of different words with the help of a limited number of phonemes. For example, since the factor ‘ūpa’ is common to the words kūpa, yūpa and sūpa, there should have some similarity in their meanings also;
but this fact is not often made clear when we say that ‘word is a combination of phonemes’ or ‘a group of phonemes form a word’. The Mīmāṃsaka-s tried to establish that it is the phonemes that give meaning. It is because of this duality of language that Grammarians raised objections when the Mīmāṃsaka-s tried to establish the above. They also accuse that the Mīmāṃsaka-s do not understand the characteristics of a language. All human languages have this duality. The roots and suffixes together are called morphemes. The terms ‘cenematic’ and ‘plerematic’ are used for phonetics and morphology respectively. The linguistic ceneme is phoneme and morphemes are linguistic pleremes.

This duality is inherent in the Morse code used in telegrams and also in computer programming languages. Dots, dashes and the blank spaces are the cenemes there. The meaning carrying morphemes made by their combinations are the pleremes. Though birds and animals also have some communication systems
such duality is not inherent in them.

b) Productivity

Another important aspect of languages is that one may be able to use words or idioms which were not heard or told earlier. But this new words or idioms will be understood by the listener without any difficulty. It may not seem to be new to them. Analogy is behind this property. Plerematic complexes formed of pleremes are generally used for communication. Various combinations of roots and suffixes are made possible by this. If each individual plereme indicates a unique object, this will not be possible. Word is formed by the combination of roots, prefixes and suffixes. These words by further combinations form compound words. It is this complexity that makes it possible to create new words whose meanings are conveyed by analogy. This aspect of language is clear among children while they acquire language. Many words that they use die out as they grow.
c) **Arbitrariness**

The relation between a plereme and its meaning which it conveys is arbitrary, not natural. It is not iconic. There have been discourses among Indian philosophers about whether this word and meaning relation is eternal or temporal. While Mīmāṃsaka-s consider it as eternal, the Naiyāyika-s consider it arbitrary. The Naiyāyika-s insists that word and meaning have no causal relation or interactive meaning and it is only arbitrarily made by god or men. On the other hand, according to the Mīmāṃsaka-s it is impossible to discover the beginning of the word-meaning relation; and so the only solution is to consider it eternal. At the same time they also agree that there is nothing more than vācya-vācaka relation between a śabda and its artha.

In the case of some words we can say that there is an inherent meaning. The words like crow and kuku are made following their sounds. It was pointed out more than 2500 years
before by Yāska that the names of birds could be traced like this. But such words are rare and exceptional.

d) **Interchangeability**

Every speaker has the ability to be a listener also. When one speaks he also hears like his listeners. The only difference is that he is not hearing through his ears. The hearing is the result of the words of the speaker falling in the ears of the listener in the forms of waves. But in the ears of the speaker it is the movement of his jaw and some other bones that enable him to hear his words. Because of this we are hearing our own words in a way different from the listeners. It is because of this that our own recorded words may at times appear strange when we hear for the first time.

e) **Specialization**

There is nothing unachievable for human language. Its word and meaning relation is arbitrary. Language has the ability
to express even minute and strange matters. It is possible to tame an
elephant or a dog by practice. There is an argument that language
acquisition is also a conditional reflex like this. ‘Abhyāsāl
pratibhāhetuḥ sarvāḥ śabdoparaiḥ smṛtaḥ’, according to Bhartṛhary\(^2\).

Similar results can be seen in the experiments of Pavlov also. The
basis for this is the fact that if we talk about one among two related
things we will immediately remember the other thing also. In the
famous experiment of Pavlov, the dog’s mouth is filled with saliva as
it hears the ringing of the bell, because it expects the food
immediately as a result of the training given. Unlike in this
experiment human language is dealing with much more highly
complex matters than this.

f) Cultural transmission

The faculties of living beings are of two types,

\(^2\) VP,II.117
hereditary and acquired. For the development of hereditary abilities special efforts are not needed. It will appear as presence of mind. Linguistic knowledge is not acquired like that. As far as birds and animals are concerned the inborn talents are the only tools for survival. Though some sort of communications take place among birds and animals also it is not common as in the case of human beings. They are communicating through sounds in four contexts, viz., for mating, while nursing their offspring, while going in search of food or dwelling and while fighting each other. But we are the only beings who speak even without any motive. The reason for this is that one of the uses of a language is to break silence and make social context easy. This is called fatty communion. (Literature belongs to this category.)

We are the only being that enrich the culture continuously through generations. We can transact our knowledge acquired from own experiences to the next generation with the help
of language. Thus one generation can start their march forward for
better living from where the predecessors have stopped.

**Language Families**

It was Franz Bopp (1791-1867) who classified the
languages into different families.\(^3\)

We have already referred to the identification of
Proto-Indo-European languages by William Jones. The comparative
linguistics led to the idea of language families whose foundation is
such common family as characteristic of different languages. We
shall briefly discuss the Indo-European one which has been subjected
to deeper studies than others. Indo-Iranian, Germanic, Celtic and
Dravidian are its branches.

\(^3\). Comparative Analysis of Sanskrit and its Related Languages, Transactions of the Berlin
Academy, (1824-1831)
a) Indo-Iranian

Indo-Aryan - Or Indic

Sanskrit which is the oldest language of Indo-Aryan family is supposed to exist as a spoken language since B.C. 1200. According to linguistic historians as a written language it is not older than Christian era. Bengali, Bihari, Hindi, Marathi etc. are modern languages of this family.

Iranian

These are Old Persian languages which had their origin during B.C. 6-4 centuries. Languages like Avestan which existed during 600 B.C. belong to this family.

Hellenic

This comprises of old Greek language and its different regional varieties.
Italic

Many languages of ancient Italic which are extinct now belong to this family. The Latin language of today also had its origin in this family.

Balto – Slavic

This consists of two sections. Lithuanian, Latish etc. of early 16th century and Prussian language originated during 15th-16th centuries belong to the Baltic section. Lusatian, Polabian, Polish, Czech, Slovak, Russian, Bulgarian, Croatian, Slovene etc. belong to the Slavic family.

b) Germanic

East Germanic, West Germanic and North Germanic are its branches.
East Germanic

It is the Gothic language which had its origin in the 6\textsuperscript{th} century and existed till 16\textsuperscript{th} century.

North Germanic

This family contains runic language of second century, Icelandic of 12\textsuperscript{th} century, modern Danish, Swedish, Norwegian and Icelandic.

West Germanic

The most important language of this family is English. Besides English Frisian language of Netherland and lower and upper German also belong to this family.

c) Celtic

Irish, Scotch Gaelic, Manx – Welsh and Breton of 8\textsuperscript{th} century A.D. and Cornish language of 9\textsuperscript{th} century belong to this family.
d) Dravidian languages

Tamil, Malayalam, Telugu and Kannada belong to this family. Begada and Kota of Nilgiri also belong to this family.

The larger family consisting of Indo-European family and now extinct Anatolian family is known as Indo-Hittite family. Comparable to Indo-European family in size is the Afro-Asiatic language family. It is known as Hamito-Semitic.

Semantics

Linguistic meanings are more specific than the meanings of non-linguistic acts like gestures, applause, laughter, crying etc. The manner of speech like shouting with anger or pleasing with mild voice is next to speech itself as our most effective method of signaling. In such nonlinguistic communication, the meaning conveyed is arbitrary and so cannot form a basis for investigation. Thus we arrive at the fundamental assumptions of
linguistics namely, “in certain communities (speech communities) some speech utterances are alike as to form and meaning.”⁴

This implies that each linguistic form has a constant and specific meaning. If the forms are phonemically different we suppose that their meanings are also different. Thus each one of the linguistic forms quick, fast, swift, rapid etc. differs from all the other in some constant and conventional feature of meaning. In short there are no actual synonyms (different words with same meaning). On the other hand our assumption implies also that if the forms are semantically different they are not the same even though they may be alike as to phonetic forms. Different linguistic forms which have the same phonetic form and differ only in meaning are known as homonyms.

In linguistics semantics is the technical term used

⁴ Language, Bloomfield
to refer to the study of meaning. This term had its origin in the French term *semantique* coined by M.Breal and appeared in his book ‘Semantics: Studies in the Science of Meaning’ (1900). But this term was not in use for two more decades. It appeared again in the book the ‘Meaning of Meaning’ by Ogden.C.K. and Richard.I.A. in 1923. Here also it appears only in a classic appendix “The Problem of Meaning in Primitive Languages” written by the anthropologist Malinowski.

Semantics is a component or level of linguistics of the same kind as phonetics or grammar. Nearly all linguists have accepted a linguistic model in which semantics is at one end and phonetic with the other with grammar some-where at the middle.

**Artha**

It is widely accepted that the Sanskrit philosophical and linguistic tradition contains materials which are relevant for
modern discussions on linguistic and philosophical semantics.

The available Sanskrit texts testify to an exceedingly long history dealing with semantic problems stretching over a period of at least 3000 years. The Sanskrit equivalent of the word meaning is *artha* and thus semantics is the science of *artha*. It is no wonder that the central term in Sanskrit discussion on semantics was *artha*. This term *artha* equally covers both meaning and referent.

Even prior to Pāṇini thinkers had started to investigate the nature and status of *artha* and its relation or lack of relation with a number of factors such as the external thing (referent) the word itself, the intention of the speaker or the idea grasped by the listener. This gave rise to different semantic theories. Although insufficient data are available for these earliest beginning, at least three inter related pre-conditions can be perceived which contributed to the developments of linguistic meaning addressed systematically. The first one is the possession of a group of specially valued texts
which are important for the religious and ritual practice of a community- the *Vedās*. The second pre-condition is the existence of a reliable system of conservation and transmission of this special text. In the case of *Vedic* text the system of transmission is at first exclusively and later mainly oral. Without such a system of conservation, no divergence between the language of the transmitted valued texts and the language of daily communication would arise. This divergence is the third pre-condition contributing to the emergence of methods and disciplines whose concerns overlap to a considerable extend with those of the modern discipline of semantics.

But in the Sanskrit tradition the *Vedās* are not the only set of highly valued texts. At an early stage itself the sacred text of Jains and Buddhists appeared. The emergence of these quite diverging and mutually strongly opposing traditions seems to have been extremely favorable for the development of the linguistic disciplines in the Sanskrit tradition. The main disciplines relevant for
semantics which have in one form or the other continued to the present day are Nyāya or logic, Vyākaraṇa or grammar and Mīmāṃsa or Vedic exegesis. Needless to say that Buddhists and Jains have contributed substantially to the first two disciplines while not to the third. More recent forms of these are called Navya- Nyāya or neo-logic, Navya Vyākaraṇa or modern grammar and Navya Mīmāṃsa or modern Mīmāṃsa.

We can clearly notice the following land marks in the historical development of semantics in the Sanskrit tradition.\footnote{Jan.E,M.Houben, Semantics in the History of South Asian Thought,2002} First, the Vedic texts form the basis of the semantic problems of later developments and to some extent they themselves contain important starting points. These include the Brāhmaṇa texts also.

The Niruktās form the second land mark and offers etymological explanations of difficult Vedic words.
The third one, early Mīmāṃsa, the system of Vedic exegesis for which the ritual injunctions (*vidhīs*) found in the Brāhmaṇās are the most important elements of the Veda.

The forth one, Pāṇini’s grammar, compiled and systematized the earlier works on grammar.

The fifth one, Vākyapadīya introduced *sphoṭa siddhānta.*

The sixth one, the work of the Buddhist logicians Dinnāga and Dharmakīrtī who made important contribution to semantic theory from a logical semantics especially the semantics of the words expresses the basic terms in a logical inference (syllogism, viz., nouns and adjectives).

The seventh one is the *dhvani* theory of Dhvanyāloka.

The eighth one is Navya Nyāya or neo-logic and
the development of precise systems of knowledge representation and competing theories of šābdabodha in different schools.

**Modern Linguistics**

The father of modern linguistics is considered to be Ferdenant de Saussure. The most important contribution by him is the concept that language is a system of systems. The significance of any factor of a system is determined by its relation to other factors of the same system. What we mean by the structure of a language is the interrelations of its linguistics elements. Saussure visualised language as an organised totality or gestalt and thus compared language to a chess board where no unit could be moved without altering the entire system of relations on the board. The Saussurian concept that a language is to be described based on itself and not based on universal categories has its base on the various studies of different strange languages by anthropologists.
Almost the same time the well known American anthropologist Franz Boas entrusted two of his students Edward Sapir and Leonard Bloomfield to study Red-Indian languages which were at the verge of extinction. They were able to record and analyse these languages by a method known as ‘discovery procedures’ extensively used by structuralists. The term discovery procedure means the method of analysing and extracting grammar of even unfamiliar languages by linguists. The studies by Boas underline the principle that the spoken languages are more important than written languages in linguistics. The comparative studies of the Red Indian language and other European languages led him to the conclusion that each language has its own grammatical structure and each one of them can be discussed only on its own basis.

Edward Sapir and Leonardo Bloomfield, each one has written a book entitled ‘Language’. It was Bloomfield and his students who established linguistics as a science in its own right
independent of anthropology. According to Bloomfield all factors which could not be measured and which could not be subjected to direct investigation should be kept outside the purview of linguistics as a science. Thus the category meaning was kept out of his investigation. Meaning or sense is something which exists only in the minds of individuals. Thus semantics was kept apart from linguistics and found a place in structural linguistics only later in nineteen sixties. Another branch is semantic differentials due to Osgood and Myron which was an experimental approach to analyse meaning.

Saussure called his theory synchronic linguistics. Here the object of study is language as a contemporary communicative system disregarding its development over time. He says that people use language to communicate and in this context the history is quite irrelevant. The only thing of relevance is the current structure of the language which he called the language state or \textit{état de langue,} as he called it.
Saussure argued that the relationship between a word and the things in the world it can refer to is only part of the meaning of the word. When we use language to communicate we also make use of systematic relationships between the various parts of a language. This relationship between a word and other words in the language is also part of the meaning of the word. For instance, the meaning of a word in a language can depend on the contrast with any other words that are available in the language to express a similar idea. This can be compared with the *apoha* theory of Buddhists.

Another source of structural linguistics was in Russia when N.S. Trubetzkoy\(^6\) sought to unite transcendental philosophy and empirical and rationalist science around a concept of a universal soul with faith as a precondition of experience. In the late nineteen twenties his colleague and student Roman Jacobson shifted

---

the focus of structural analysis to study how languages change. Another important name associated with structuralism is that of the French anthropologist Claude Levi Strauss who was associated with the existentialist Jean Paul Sartre. He came in contact with Jacobson in nineteen forties who extensively developed the relationship between anthropological and linguistic studies.⁷ Among his students a name that deserves special mention is that of Louis Althusser, who sought to merge Marxism and structuralism.

Structuralism being an attempt to apply the elements of positivism of natural sciences to social sciences has influenced almost all its branches. The limitations of structuralism to social sciences in contrast to exact sciences came to the surface by the second half of last century. This led to the deconstructionalism of Jacques Derrida and the beginning of an era of post structuralism.

Like Saussure, Bloomfield also was greatly

---

⁷ Structural Anthropology, 1958
influenced by the logical positivism movement of his time. To start with he needed a firm scientific basis on which to establish his linguistic theory. He found that in behaviourism, the branch of psychology of that time.

The behaviourist approach rapidly produced a substantial body of reliable linguistic data. But they failed to take further analysis of these data, the formulation of hypotheses and theories that fit the data. Structuralism also could not make much progress due to its inherent weaknesses.

Behaviourism which originated at the dawn of last century asserted that psychological method should be objective. They stressed that these could be described in terms of the stimulus and response of the activities of all beings including mankind. So they concluded that the significant factor was not what the individuals think but their actions. The behaviourists did not include any factor which could not be directly observed in their studies. Thus when
Bloomfield studied morphemes (śabda) under the influence of behavioural psychology, he excluded the indirect meanings. Śabda is a physical entity while artha is something which exists only in human mind. Bloomfield believed that including meaning analysis in language analysis, would weaken the science of linguistics. So he dissuaded his followers from meaning analysis. Subsequently the meaning analysis became fully absent in linguistic studies. Thus it was restricted to the structural description of śabdās, padās and vakyās. Later when the elements of meaning were introduced in the American linguistics, towards nineteen sixties, the golden era of structuralism was over.

By the invention of computers many linguists started believing that the science of linguistics has progressed to a stage where the analysis of language could be entrusted to a computer. The idea of machine translation was first proposed in 1949. By 1955 around hundred institutions spread over three
countries had started efforts in this direction. The analysis of audible \( \textit{\textit{sabd\=a}s} \) had also started simultaneously. The instrument called spectrograph was invented in 1945 for this purpose. The new urge in science after the 2\textsuperscript{nd} world war had its impact on linguistics also. A significant development was in the field of information theory which classified the information according to their merits or comparative significance.

Another development in this field was the rise of a new science called psycho linguistics which combined psychology and linguistics. Yet another development was the emergence of empiricism in America during 1930 to 1960s which insisted that all knowledge which are amenable to analysis are acquired through experience only. Earlier towards the beginning of 20\textsuperscript{th} century itself logical empiricism had made its presence in philosophy.

It was Osgood who initiated the development of an experimental method for the analysis of meaning. His ‘Semantic
Differentials’ was an attempt to give a basis for meaning by measuring the reflections on aspects related to words. Though the linguists in those days considered it as childish, many of them had an expectation that his method would give an objective basis for meaning.

Coming back to structuralism, it failed to answer some basic questions of linguistics. A language has only a finite number of words, however large it may be. But there is no limit for the number of sentences that can be made with it. For example even by combining two sentences one can make a third one.

A six year old child knows about 13-15 thousand words, though he might not have used or heard them all. For example William Shakespeare had to use only 15000 words in all his works together. Suppose a man uses only 10000 words. Also assume that he makes grammatically correct sentences of less than 20 words and he takes 5 seconds for each sentence. He will take one hundred thousand
trillion years to speak them all!

This was not a mere theoretical question. Professor Selig Harrison of Pennsylvania University also raised this question. Since he was influenced by the positivism of 1930s he was of the view that mathematical techniques were to be used in linguistics. This was done by his student Noam Chomsky who has a strong background in both mathematics and philosophy.

**Language and Logic**

In the West the relation between thought and language and between language and object world was first studied by the Greek philosopher Parmenides (5th century B.C.). When we think, we are thinking about something. When we utter a name, it refers to something. One cannot think or talk anything about something which does not exist. Thus thoughts and language warrant external things. If

---

8 Good bye to Descartes: the End of Logic and the search for a New Cosmology of the Mind, Keith Delvin, John Witley and Sons, 1997
one can think or talk about something more than once, it exists in
time unchangingly. This concept of changelessness in nature led to
the famous paradoxes of Zeno, which could be completely resolved
only in 19th century.

Logic is the science of rational thoughts and arguments. Thus logic is closely related to linguistic analysis also.
The discovery of Boolean algebra as algebra of thought in the middle
of 19th century made logic algebraic, dealing with abstract
propositions as symbols devoid of any meaning. The result was a
metamorphosis — logic became mathematical while the linguistic still
remained a social science, more concerned about the characteristics
of languages than its functional aspects. But it did not continue for
long thanks to the effort of Noam Chomsky.

**Linguistics, Logic and Mathematics**

It was in this context that in 1950s Noam Chomsky
initiated the exploitation of the dual relation between logic and language. Instead of looking at language to understand reasoning as the logicians did, he showed how to use the techniques of logic to study language. The basis of this approach is that language is a logical phenomenon. Thus was paved the way to his transformational generative grammar, introduced in his epoch making book ‘Syntactic Structures’.

When structuralism was losing its supporting legs of science and philosophy, Chomsky re-established them. Chomsky called the scale of measurement the ‘external conditions of adequacy’. There are two ways of construction of sentences in Chomsky’s method.

1. Phrase structure rules.

2. Transformation rules.

Pāṇinian grammar is in fact a predecessor of
Chomsky’s grammar. But it was Chomsky who introduced mathematical logic in western linguistics.

**The Basis of Transformative Grammar**

Here the basic idea is that each sentence has an external or surface structure and an internal or underlining structure. Using the combining rules of words the fabrics of underlying structure is formed and applying the rules of transformational grammar these are transmitted to the surface structure.

Chomsky’s rejection of the idea that grammaticality and acceptability makes scientific the grammatical sentences was discarded by his own followers. This convinced him the futility of an abstraction. The fact is that when a physical explanation becomes impossible for grammaticality, the rational linguists are somehow forced to accept abstract linguistic theories.
Generative Grammar

The aim of linguistic theory is to explain and foresee linguistics events. Here we have to explain the theory, generativeness, the linguistic ability, clarity of explanations and model.

a) Theory

The role of linguistic theories is to explain phenomena by combining experiences which are apparently distinct.

b) Generativeness

In grammar the meaning of the word generative is clear tabulation.

c) Language Ability

It is the inborn knowledge of a linguist about his language.
d) Clarity

We have to deal with the grammatical rules as rigidly as in mathematics. This is meant by clarity.

e) Model

This means an abstract programme prepared to explain the internal relations latent in phenomena.

The behaviourists also had attempted to compare language learning with the aberrations in animal behaviour. But there are many factors that they failed to explain.

1. They failed to account the fact that a speaker – listener could create/ understand an infinite number of words and sentences.

2. Language acquisition is an inborn ability of man or there are some aspects of human mind which defines how to acquire a language.
3. The intensive training or acquisition of language takes place till the age of twelve. After that the ability to learn languages starts declining. It is to be noted that the development of a child’s brain is intensive between the ages two and twelve.

4. There are some universal characteristics for languages. The factors which are common to all languages are known as language universals.

**Language Universals**

These are structural and formal and elemental.

a) **Structural Universals**

The structural universals are related to the grammatical structure of languages.

1. All languages have syntactic and semantic factors.
2. All languages have a surface structure and an underlying structure.

3. All languages have phrase structural rules and transformational rules.

b) Formal Universals

1. Phrase structural rule develops as simple as a string

2. Transformative rule transform one phrase structural form to another one


c) Elemental Universal

1. All languages have consonants and vowels.

2. All languages have only oral vowels.

3. The languages having atikharās will have kharās also.
4. Fricatives will be a śabda [s] in a language.

**Cognitive Theory**

Noam Chomsky developed a theory based on cognitive psychology as an alternative to behaviourist theory. A comparison of the practical theory and cognitive theory will bring out their distinctive features.

According to the practical theory the stimulus and response are directly related. But according to cognitive theories there is a cognitive function also between them.

Cognitive function is one that can be performed only by human mind and language study depends on cognitive function. Therefore language study also can be performed by human race only. The practical theory considers mind as a clean slate. The information obtained from linguistic society is being written on this clean slate. Thus all these information are obtained from outside
only. But in cognitive system a language device is inbuilt in human brain. The major share of language is internal to this language acquisition device (LAD). The human brain has got a very complicated and well developed structure. There is a part of it that helps language study. This part is known as internal language factor. It is a collection of rules and metaphor.

In behaviouristic model language means the language in practice or expression. The language practice is made evident by speaking, hearing, reading, writing etc. What is meant by language in cognitive model is the expertise needed for this language practices. If language is a practice for practical theorists it is a rule based creativity for cognitive theorists. While the practical theorists argue that language is acquired through practice, cognitive argues that language study is the formation of rules through insight. Practical theories stress on the environment. So they give importance to teaching and forget the significance of the taught. On the other
hand the cognitive stress on the internal system. Since these are inborn they give importance to learning than to teaching. Thus the stress is on taught and not on teacher. Linguistic theories are related to finding what is the mental reality, that is latent in language activity. Because of this linguistic theory is related to mind. Though the ideas like expressional ability and language ability are related to the concepts of parole and lang of Saussure, Chomsky discarded the concept lang. While according to Saussure lang is the ordered table of linguistic elements, for Chomsky language ability is the system latent in generative processes.

The ability to understand infinite number of sentences is inbuilt in language understanding. Based on this it is insisted that the generative grammar should have a system of recurrence rules that makes possible this generation of infinite sentences. These generative rules are classified into three.
1. Syntactic component.

2. Phonological component.


Syntactic component consists of an infinite set of abstract objects or formatives. These formatives have all information that gives a unique meaning to a sentence. The phonological components give pronunciation form to the structures produced by syntactic rules. The semantic component defines the interpretation of a sentence. The phonological and semantic components are explanatory in nature. What these components do is making use of the information given by semantic component about the generatives, their internal characters and their inter- relations in a sentence. As a result of this each sentence is given a deep structure and a surface structure. It is the deep structure that defines the meaning of the sentence. The phonemic form is defined by the surface structure.
While the deep structure is explained using semantic component, the super structure is interpreted by phonological component.

For each sentence there is a series of base phrase makers that is produced by the syntactic component. The transformative component is a part of the syntactic component. It is this transformative component that produces a sentence with super structure on the deep structure.

It became necessary to develop a theory of universal semantics in order to answer the question how far the syntax is depending on semantics. Chomsky also has taken the stand that syntactic structures could help the semantic aspects. He points out that though semantic aspects have a role in the formulation of linguistic theory in no way we can establish that the semantic aspects has any role in selecting the syntactic or phonetic factors of grammar. Many problems are pointing to the fact that the syntax and semantics have to strike a balance. It is in this context that Chomsky tried to
relate them.

Grammar has syntactic, semantic and phonetic parts. The semantic and phonetic aspects are purely interpretational in character. They have no role in originating sentence structure. In syntactic part there are both basic part and transformational part. The basic part comprises grammatical categorical subcomponent and lexicon. It generates the deep structure components. This deep structure enters the syntactic portion and acquires meaning interpretation. The deep structure is taken to the super structure by the transformational rules. The rules of phonetic part give phonetic interpretation to the super structure. The role of grammar is to give meaningful interpretations to symbols. It is the rules of semantic part that mediate the relation between symbols and meanings.

What is there in grammatical categorical subcomponent is a layer of context-free rewriting rules. The role of these rules is to define a specific system of grammatical relations
which determine meaning interpretation and clarify an abstract underlying sequence of elements that makes possible the application of transformational rules. The rules of the basic factor are universal to a large extent. And so they are not of any particular grammar. Even if they are partly independent, these rules will be subject to the universal rules of the defining roles of grammar. In the same way the syntactic categorical subcomponent symbols that appear in basic rules are being selected from a constant universal alphabet. The selection of a symbol fully or to a large extent is defined by its formational role in a system of basic rules. The infinite generative character of grammar is originated from a formal specific character of grammatical category rules. The fact that the initial sign ‘S’ of a layer of origin can be assigned to the grammatical categories is this specific character.

A common fact forms phrase structure signifier by applying the grammatical category rules in a definite order. This
process goes ahead starting from ‘S’ and during its evolution the rules being applied in every ‘S’ whenever it appears. The string thus obtained becomes a generalised phrase structural signifier when the word descriptions are added to it. This addition of word description is done according to the transformative rules that specify the contextual metaphors belonging to the word description. In this way the basic factor of syntactic part generates the infinite set of generalised phrase structural signifiers.

A lexicon consists of an unordered set of word descriptions and redundancy rules. Each word description is a set of metaphor. Some of them are phonetic metaphors taken from a set of universal phonetic metaphors. Some others are metaphors related to meaning. They also may be considered to belong to a universal alphabet. It is possible to select a set of phonetic metaphors from a word description and to represent as a phonological matrix bearing an ‘is-a’ relation with specific syntactic aspects in the word
description. A metaphor is described as meaningful, if it is not referred in any syntactic rule. Thus arises the question whether syntax involves semantics. In all circumstances that could be foreseen the redundancy rules of lexicon combine and specify the metaphors. The word descriptions form the universal set of disorder in language.

The transformational sub-factor consists of a set of single transformational elements. Each transformation is fully defined by structure index and string of elementary transformations. The structure idea is the Boolean condition of analysability. The concept of analysable is defined on the basis of an ‘is-a’ relation. On the other hand the ‘is-a’ relation is defined by the rewriting rules and lexicon of the basic part. In this way the transformations can point to syntactic metaphors as specific grammatical categories.

When a generalised phrase structural signifier is
obtained, a transformational evolution can be evolved by applying a string of transformational rules in the ‘from the bottom up’ style. This means that in order to apply a string of rules to a particular structure, if there are no restrictions on the transformations, the genesis of the well-nit surface structure is made possible. Only in this circumstance the generalised phrase structure signifier becomes eligible for the status of deep structure. It is this deep structure that expresses the semantic content of a sentence. The pronounced form is determined by the surface structure.

Chomsky proposed that words could be metaphorically divided into two; higher level and lower level. For example the word countable belongs to higher level while man is of lower level.

**Weakening the Rules**

a) **Island constraints**
The attempts made by Ross\(^9\) (1967) to reduce the transformational rules in the formation of sentences are important. In his thesis ‘Constraints on Syntactic Variables’ he mentioned certain domains beyond the purview of such rules. So these constraints are called ‘island constrains’. According to these constraints it is not permitted to bring out factors by the transformational rules from a structure called island. The various constraints suggested by him are complex noun phrase constraint (CNPC), co-ordinate structure constraint (CSC), wh–island constraint and the sentential subject condition (SSC).

b) Subjacency condition

This was suggested by Chomsky in 1973 in place of some of the island constraints. Thus CNPC, SSC and wh-island constraint are all seen latent in subjacency conditions. In short it

\(^9\) Ross. P.E. Constraints on Syntactic Variables, 1967
means that no element can be taken in a well defined meaning to a
long distance by ‘movement rule’. That is, from a well formed
sequence of words, a particular word can be taken to a well defined
distance only. When the movement crosses the limit the structure
obtained become ridiculous. This subjacency condition was later
developed to boundary theory.

This section will be concluded with a brief
discussion of Noam Chomsky -1996\textsuperscript{10}

The basic assumption in modern linguistics is that
there is an inborn language faculty in us i.e., there is a portion of our
brain (mind) dedicated to language learning. It is a specific part of
our activities. It may be called a linguistic organ like our eyes and
ears. Though this is an assumption there are enough evidences
conforming to it.

\textsuperscript{10} Language and its Design: The Delhi Lecturer, January 1996, Noam Chomsky.
Thus it is assumed that there is a language faculty which has a cognitive faculty to store information. There should have a performing system to deal with this information. To some extent this performance system is also a part of the language faculty.

**Cognitive Faculty**

The genetically defined initial state of the cognitive faculty is different from the states it acquires at different circumstances. This may be either due to its internal growth or by the influences of external experiences. This is called language acquisition. The term ‘language learning’ which is usually used is misleading, because it is more associated with the process of development than with the act of learning. When a child is brought up in a particular environment, the language acquisition takes place automatically provided there is correct inspiration. The child is not doing anything for this. It is just like one growing when he gets food.
Language can be considered as nothing but a state of language faculty. Thus when one says that he knows a language or he has learned a language it means that his language faculty can attain that state. In this sense the language gives instructions to the associated performance system.

How is it working? To answer this question, it is assumed that it is taking place through a system called linguistic expressions. Each language name is a collection of certain characteristics. Each language generates a large number of nouns. In this sense language theory is called generative grammar. (Grammar produces sentences and their structural details—the first one weakly and the second one strongly. Grammar is called generative to make clear how the grammar is giving order to the sentences.) It is generally believed that the executing faculties are generally associated with the two language elements — śabda and artha. There are certain nouns indicating śabdās which are thousands of years old.
The names denoting word and meaning are analysed by perceptual stimuli. We are interacting with the outside world with the help of this names and the information obtained by the above analysis. The above system of perceptual stimuli may be called conceptual intentional system. The term intentional refer to the relational part of the system. The objects are meant for something. Therefore the conceptual intentional systems are those which enable one to pick up names that he wants to convey by not so simple language.

The assumptions mentioned above that there are two access systems and two executing systems may appear rather surprising. This assumption is as old as the beginning of the linguistics. But if one wants to deal with it seriously he has to bring it to the surface. Then he will understand how astounding it is. Rather he will be convinced that it is fictitious. From the existence of sign language it is clear that the language faculty can convey ideas which are outside the domain of speech and sense organs. These facts
justify the above fictitious assumptions.

The above assumptions were taken seriously for study in the light of generative grammar about sixty years back. One reason for this was the advances in formal sciences. Without the help of the tools of the formal sciences itself we have been able to understand an important characteristic of languages, viz., how we are able to make use of the limited resources in an unlimited way. There was no clear answer to this question to the middle of the last century. By that time the theory of computability and related theories were able to give a clear answer to some parts of this question. But this only helped to make clearer the questions involved and formulate it in a way amenable to deeper analysis. It was a harmonic combination of the traditional style of linguistics and advances in newly born branches of science that led to this new direction in language studies. This opened new avenues of the newly found generative grammar.

A major problem appeared immediately. At the
very beginning of generative linguistic analysis contradictions arise about two aspects. They are known as descriptive adequacy and explanatory adequacy. The roots of this contradiction lie in the problem of language acquisition. Genetically one has no affinity to any particular language. But the language acquisition seems to be highly mystic when languages are highly complex in nature and distinct from each other and information that one obtains by linguistic studies are comparatively simple. But this is a wrong perception. The language acquisition is a natural process. Therefore the notions about the language intricacies are also wrong. In other words the languages should be simple and analogous in some aspects. Otherwise one cannot acquire it irrespective of his intellectual calibre. But at the same time they appear to be highly complicated and heterogeneous. It is because of the ignorance about the nature of languages. A deeper study will make it clear that the heterogeneities are only superficial.
Our perceptual stimuli should have properties related to phonemic and rhythmic properties. A name without these cannot be read or spelt by these stimuli. The conceptual system should know about words and sentences and their inter relations. In addition, the inter relation between word and meaning is also needed. But these are outside the system related to the clarity of meaning. As an example, Chomsky considered the sentence, ‘John had a book stolen’ which could be interpreted in different ways. Clearly the ambiguity in the meaning is not because of the inability to interpret its factors. Thus whatever the relation between word and their meanings is, it should be outside the system of execution. They are controlled by the laws of phonology and semantics.

If human language is perfect in all respects, the relation between śabda and artha should be unique in the case of any sentence in any language. The best theory is that which suits the conditions of clarity. It will not be changed by the additions of
conditions on the basis of practical experiences.

The linguistic studies of thousands of years were based on the assumption that in order to bring out the characteristics of a language we will have to make use of at least the relations between words and their meanings. But this was questioned by Chomsky. He argued that if the conditions about clarity are known the relations between words and their meanings will follow it. We don’t require any proof to know the characteristics of any language. Same is the case with many other proofs obtained by practice.

This new approach has brought forward new problems also. Firstly, against the existing belief, a language has no other level apart from that of phonemes and semantics. As we are not interested in other conditions for clarity there cannot have any other level. Thus these additional levels considered till now were techniques to fill the gaps in perception. But giving them up will provide better explanations. In technical sense there are no different
levels of distributions. Such classifications were based on misconceptions. These are to be considered as belonging to the beginning of linguistics.

Next problem is to prove that nothing new is included in language other than a set of words. It is interesting to note that at this instance Chomsky discards many of his earlier concepts like $x$ bar theory, $c$ command, $d$ structures and $s$ structures. Language is incomplete in all this cases, though is difficult to establish otherwise.

In fact there are many interesting things which seem to be incomplete. One such thing in language is the character of displacing instructions. This is universal and somewhat complex in nature. This is not included in the symbolic methods formulated for special purposes often called formal languages. What is meant here is the fact that the phrases which form a part of sentential structure are interpreted after such displacement. This characteristic is a universal
phenomenon. It has an important role in the interpretation of word and meaning. As an example, consider the sentence, ‘this book seems to have been stolen’. Here what is the relation between the words book and stolen? There is no natural and positional relation between books and stolen in this case as in the sentence ‘John stole the book’. This character of displacement of words is common to all languages and seems to be a short fall. It is a fact that one is not bothered about the completion of something which has been formed for a particular purpose as long as it is served. He has to first explain this characteristic and somehow snatch it. In early generative grammar one snatched these characteristics by shifting the emphasis from explaining the meaning of sentence to explaining the pronunciation. This is a grammatical metamorphosis. There are means for such snatching of displacement character in all grammatical theories. It is a fact that the language has this character. The problem is the exact form of this character. It seems that this inference is almost correct. If
so, there should have a general method in all languages for cutting off a phrase from one part of a sentence and pasting it in some other part. If it doesn’t affect the completeness of the sentence seriously our simple assumption will be that this matter ends there. This possibility of cut and paste implies that the phrase could appear at two places of the sentence. This is the simplest assumption.

There is a more complex assumption. Here more than one operation takes place. One is cutting the phrase from one place and pasting it at another place. Following this he deletes the former. Here there are two actions and so more complex. From an external observation it seems that the more complicated assumption is the right choice.

How this characteristic of displacement arises in a language? There is not much progress in understanding this. The fact remains that it is there and also there are some ideas about it. These ideas could be reinterpreted relating it to the conditions for clarity.
For example there are two levels of semantics called deep structure and surface structure as mentioned earlier.

In this matter languages differ. In Sanskrit language there are clear displacements for *vibhakti pratyaya*, while it is almost nil in English. It is less in Chinese also. So these languages seem to be entirely different. Moreover the word positions are different in different languages and so they differ in *anvayās*. Because of this a word by word translation will not carry the meaning.

But these differences prove to be superficial. Thus Sanskrit which is rich in *pratyaya* and Chinese which is devoid of them are comparable or similar and both are structurally identical beyond the superficial and both are identical in form above the apparent differences in *śabda kośa*. So they are one and same for our mind. They are different only in accepting sound modulations by perceptual stimuli system. Other languages have more words and
gender, number, case specifications compared to Sanskrit.

This is true in the case of word positions in sentences. Though they are basically identical perceptual stimuli system presents them in different forms. We can also try to prove that our aim is to make maximum use of the universal characteristics of languages.

Chomsky’s approach is discussed here because his ‘Syntactic Structures’ is considered as a landmark in the development of linguistics. He is familiar to the students of mathematics and computer science by his definitions of language and automata in terms of set theory which are beyond the scope of this thesis.

After ‘Indian Theories of Meaning’

Coming back to the East, Rāja’s book ‘Indian Theories of Meaning’ appeared in 1963. The further studies are
briefly discussed in the following sections.

According to genesis 2.19-20 the god created all living beings and plants and gave them names. Thus arose one of the most misleading notions of mankind that language originated from naming.\textsuperscript{11} This belief about the origin of language was held not only by the ancient Near East but by Greece and China also. According to this concept the grammar is not part of language but imposed upon it from the outside.

The Chinese had gone ahead accepting that language consists of sentences and prepositions in addition to names. For them the language is not only for naming but also for issuing orders.

Foremost Chinese scholars, who touched upon the origin of language is the Confucian philosopher Hsuntzu who wrote

\textsuperscript{11} Frist Staal, Oriental Ideas On The Origin Of Language, JAOS, Vol. 99, No. 1, 1979
the chapter on the ‘Rectification of Names’. He believed that language was the creation of the sage-kings of the Chou dynasty. Further, names have no intrinsic appropriateness but are purely conventional. He also refers to larger units constructed from names. Thus prepositions are the combinations of names for different realities put together so as to express a single meaning. The later philosopher Tung Chungshu included orders also as a factor in the origin of languages. Staal points out that though imperatives do not suffice to explain the origin of language, they are better candidates than names. This was the view held by many 19th century western scholars also because of their formal simplicity (eg:-‘go’, ‘come’, ‘sit down’ etc.). Unlike the Confucians the early Taoists, another class of Chinese philosophers, were not interested in languages. Later Taoists like Kuo Hsiang of late third century A.D. went to the extent of saying that analysing principles underlying names ‘may truly be called useless talk’. But towards the end of forth century, one can
find Indian influence in the Taoist ideas about language. This might have come together with the *dharaṇi sūtras* which were influencing Chinese religious practices. About Buddhist’s attitude towards the origin of languages Staal opines that the Confucian doctrine that names are conventional helped to pave its way, and that it could not have any significance in China had it not itself considered language conventional and therefore dispensable.

When talking of Indian ideas on the origin of language Staal says that he is disappointed that Sanskrit does not distinguish between names and nouns, at least outside *nāma*. And so Indians confused names and nouns. At the same time Staal also points out that in India language is not something for naming and is in general something with which for doing. Therefore, performatives, speech acts and pragmatics, all developed in India, and verbs are at least as important as nouns. At an early date (in the *Nirukta* and *Prātiṣākhya* literature supposed to be of 6th century B.C.) the
Indians distinguished nouns and verbs (nāmākhyāta) from each other and also pro verbs (nāmākhyāta) and particles (nipāta). More important than these is the fact that the Indian theories considered larger units of language than words. This has escaped notice of most of the western scholars because of the analysis of words in smaller elements like roots, stems and suffixes.

The earliest analysis of language in India is the analysis of the Vedic samhitā into its constituent words (padapādhā). This may have taken place between the 10th and the 7th century BC. This padapādhā is constructed by detachment the words of Vedic utterances from each other, dissolving the sandhi combination between them and breaking the influence of the word accent in as far as it goes beyond word boundaries. Since the process involved is the word-for-word analysis, sentences are given primary importance.

Staal points out two reasons for this. Firstly Sanskrit became a subject of serious speculation long before it was
written down toward the end of the *Vedic* period. Thus the illiterate
speakers do not perceive the flow of speech as consisting of words,
but rather of larger units, such as phrases. The second reason is that
the *Vedic* corpus, which was handed down orally, was thought of as
consisting of *mantrās* and similar units at least as long as a verse, line
or sentence. The main reason that a *mantā* is a single unit is its ritual
function and character. In *Vedic* ritual, one mantra corresponds to
one ritual act, which itself constitutes a single unit.

The earliest reference to the origin of language
occurs in the *Ṛgveda* which approaches it within a ritual perspective.
The grammatical analysis probably originated because the artificial
language of ritual (especially in the *Sāmaveda*) was so extra
ordinary, that it simply demanded analysis. The next step was to
transfer such analysis to ordinary language, which culminated in the
grammar of Pāṇini. Thus was established a very close connection
between grammar and the science of rituals.
Like language, ritual is recursive making infinite use of finite meanings. This is one of the most important discoveries which the Indians made in this realm, more than 2000 years before Humboldt and Chomsky. Now looking from ritual to language the most important feature of Vedic ritual is the recitation of mantrās. Each piece of Vedic rite is accompanied by the chanting of a mantrā.

For example, a mantrā is recited when each brick is placed in the construction of the altar. In the case of nāma in the sense as name in Indian philosophy the empirical world is nāmarūpa (of name form). In the Upaniṣads one frequently meet with the phrase ‘nāma eva’ i.e. names only. The best example occurs in the discourse between Nārada and Sanatkumāra in the 7th chapter of Chandogyopaniṣad. The seer Nārada approaches the great sage Sanatkumāra and requests instructions. When Sanatkumāra asks him what Nārada knows already, he lists them all. Then Sanatkumāra says ‘all you enumerated is names only’. Sanatkumāra takes Nārada up the
metaphysical winding stairs of a cosmic hierarchy and shows that beyond names there is language, beyond language spirit, beyond spirit thought, beyond thought reason and so on. Thus proceeding Sanatkumāra introduces him to the Infinite. No theory which confines itself to naming is in a position to explain the origin of languages. One has to start with the grammatical structure. Moreover in the absence of any solid knowledge on the subject, legends and myths are as serious as serious speculations. Not only philosophy even ritual can be illuminating.

**Sanskrit and Computer Science**

Pāṇinian grammar was introduced to modern linguistics as a forerunner of Chomsky’s generative grammar.\(^{12}\)

‘Many linguists, foreign and Indian, joined the bandwagon and paused as experts in Pāṇinian grammar on

---

Chomskian terms\textsuperscript{13}. The renewed interest has influenced the interpretation of Pāṇinian itself as generative grammar. The first in this direction was due to Kirparsky and Staal 1969,\textsuperscript{14} who proposed a hierarchy of four levels of interpretation. This was criticised by Houben (1999)\textsuperscript{15} as they did not permit semantic factors; the science of grammar does not teach the communication of meaning that is already known from ordinary usage, rather, it teaches correct usage in the conveyance of the decided meaning. But this does not mean that semantic issues are outside the domain of grammar. As stated earlier, the use of words is for the purpose of the comprehension of the object they denote. With the intention ‘I will give the understanding of an object’, a word is used.

\textsuperscript{13} Joshy.S.D,Back Ground Of the Astadhyayi,3\textsuperscript{rd} International Symposium on Sanskrit Computational Linguistics,Hyderabad,2009


Other important contributions are due to Rocher.R 1964\textsuperscript{16}, Sinha.A.C\textsuperscript{17} 1973 and Cardona\textsuperscript{18} 1976. According to Rocher, the \textit{kārakā} categories are extra linguistics or psychological rather than linguistics or formal in nature. Sinha ascribes to Rocher the view that Pāṇini’s grammar had semantic components. He asserts that all grammatical relations are semantic relations in Pāṇini. According to him the \textit{kārakās} are well defined semantic concepts independent of Sanskrit noun morphology in so far as the \textit{vibhaktīs} are concerned and must be viewed as semantic categories. The real advantage of considering the \textit{kārakās} as semantic rather than syntactic lies in the fact that they can be established independent of all grammatical devices akin to Sanskrit. This has been further

\begin{itemize}
\item[\textsuperscript{16}] Rocher, Rosane"‘Agent’ et ‘object’ chez Panini’,JAOS 84: 44-54
\item[\textsuperscript{b}] ‘The technical term hetu in Panini’s Astadhyayi’,VIJ 2:31-40
\item[\textsuperscript{17}] Sinha,A.C.,“Generative semantics and Panini’s Karaka”,JOIB 23:27-39
\item[\textsuperscript{18}] George Cardona,\textit{Panini –A survey of Research}, The Hague,1976
\end{itemize}
discussed in Cardona 1967\textsuperscript{19} and 1976. According to him it is possible, though not completely exact, to say that Pāṇini’s definitions of *kārakās* are set up on the semantic level but he rejected the proposition that these categories have nothing to do with grammar.

Joshy continues: ‘somewhat later, Chomsky had drastically reversed his ideas and after this enthusiasm for Chomsky subsided, it became clear that the idea of transformation is alien to Pāṇini. Now a new type of linguistics has come up, called Sanskrit Computational Linguistics (SCL). Although Chomsky is out, Pāṇini is still there ready to be acclaimed as the forerunner of SCL’. The SCL was identified as a branch of study in 2007 only.

**Sanskrit Computational Linguistics**

In 1985, a NASA scientist Rick Briggs, in a paper entitled “Knowledge Representation in Sanskrit and Artificial
Intelligence”\textsuperscript{20} drew attention of computer scientists to the works on semantics in Sanskrit literature. The important fact to be not is that, instead of Pāṇini he was referring to the ‘Vaiyākaraṇa Siddhānta Lakhu Mañjuṣa’ of Bhaṭṭa Nāgeśa, (1730-1810), perhaps the last Sanskrit scholar in the Indian tradition.

Briggs questions the widespread belief that natural languages are unsuitable for transmission of many ideas that artificial languages can render with great precision and mathematical rigour required in computer processing. He says that this belief which resulted in wastage of much money, effort and time is false as “Sanskrit has all the characteristics required of an artificial language.” Among the accomplishments of the grammarians of Sanskrit can be reckoned a method for paraphrasing, that language in

\textsuperscript{20} Rick Briggs, Knowledge Representation in Sanskrit and Artificial Intelligence, AI Magazine, vol.6, No:1, p.30-39
a manner identical not only in essence but in form with work in artificial intelligence. He tries to demonstrate that the natural language Sanskrit can serve as an artificial language.

Briggs compares a typical Knowledge Representation Scheme (KRS) using semantic nets and the method used by ancient Indian grammarians to analyse sentences unambiguously.

As an example Briggs consider the sentence

‘Caitra goes to the village’ or ‘grāmam gacchati caita’.

This sentence is analysed by Nāgęśa Bhaṭṭa as follows: “There is an activity which leads to a connection-activity which has as Agent no one other than Caitra, specified by singularity, [which] is taking place in the present and which has as object something not different from village.”

In the case of modern semantic nets the above
information can be stored as:

\[
\text{go, agent, } \textit{Caitra}
\]

\[
\text{go, object, village}
\]

in two "triples".

As another example he considers the sentence

"John gave the ball to Mary".

In the Indian interpretation the agent is represented by John, the object ball, the recipient Mary, the act give and the tense past.

In a semantic net for this sentence, there are five nodes connected by four arcs as follows:
Here the grammatical information is transformed to arcs and nodes.

The information also can be stored in triples as

give, agent, John

give, object, ball

give, recipient, Mary

give, time, past.

As Briggs point out, it is a matter of surprise to discover that the outcome of both trends of thinking – so removed in space, time and culture – have arrived at a representation of linguistic events that is not only theoretically equivalent but close in form as well. The one superficial difference is that the Indian tradition was not familiar with the facility of diagrammatic representation and instead had to resort to abstract notions in grammatical representations.
Another main difference is that the Indian analysis of a sentence was not based on a noun-phrase model with its attending binary parsing techniques of modern time, but instead on a conception that viewed the sentence as springing from the semantic message that the speaker wished to convey.

Though addressed to computer scientists this paper, rightly or wrongly, induced great enthusiasm among Sanskrit scholars. Some of them went even to the extent of claiming that the future direction of research in artificial languages would be decided by Sanskrit. The immediate result was the ‘First Seminar on Knowledge Representation and Samskrtam’, 1986, held at Bangalore. Briggs presented a paper entitled ‘Śāstric Sanskrit: An Inter Lingua for Machine Translation’ in this seminar.

Thus computational Sanskrit emerged as a new branch of research. Automated reconstruction of Sanskrit texts and
machine aided translation(MAT), designing a working system of Pāṇinian grammatical frame work for machine translation especially for Indian languages, its possible application in cognitive science, AI are some areas of active research in Sanskrit and computer science departments of many universities and institutions in India and abroad.

A question that naturally arose was the role of Sanskrit as a dedicated programming language which meant the development of a compiler for use of Sanskrit instructions. The Centre for Development of Advanced Computing(C-DAC) had initiated some work in this direction in early 1990s itself. To what extent the research has been successful after twenty years is a question.

The international symposiums on Sanskrit Computational Linguistics were the result of the attempts to provide a common platform for the traditional Sanskrit scholars and the
computational linguists. It was a culmination of the World Sanskrit Conferences, especially the thirteenth one held at Edinburg and the First National Symposium on Modelling and Shallow Parsing of Indian Languages in Mumbai, both held in the year 2006. The first symposium of SCL was held in France in 2007 and the last one at Jawaharlal Nehru University 2010.

Underlying all these descriptions referred to by Briggs is the pre-supposition that the main structural relation in the sentence is that between qualifier and the thing to be qualified (viśeṣana/viśeṣya) and unlike grammarians and Mīmāṃsakās for whom the viśeṣya is verb, for nyāya thinkers the viśeṣya is the noun in the first ending.

Coming back to Briggs, what he had pointed out was only that Sanskrit is most suitable as an interlingua in machine translation in the field of AI. To quote from him 'the degree to which a semantic net is cumbersome and odd —sounding in a natural
language is the degree to which that language is natural and deviates from the precise or artificial’. According to him Sanskrit has a deviation of ‘zero’ from the artificial. Thus Sanskrit has all the attributes of an artificial language sought to for by AI experts.

Joshy was quoted earlier from his paper ‘Back ground of the Aṣṭādhyāyi read in the 3rd International Symposium on Sanskrit Computational Linguistics held in 2009 at Hyderabad. He continuous: ‘contrary to some western misconceptions, the starting point of Pāṇini’s analysis is not meaning or the intention of the speaker but word from elements. Pāṇini starts from morphology to arrive at a finished word’.

In contrast to other works Brigg’s paper has for the first time drew attention of computer scientists to the semantic theories available in Sanskrit. Since it is meaning that is important in a sentence, syntax is developed to tackle the semantic problem. But
centuries were elapsed before Bhartrihary (4\textsuperscript{th} century A.D.)
developed \textit{spho\textit{\i}ta} theory after P\text{"a}nini. Again centuries elapsed before
N\text{"a}ge\text{"a} Bha\text{"a}\text{"a} gave completion to \textit{spho\textit{\i}ta} theory in 18\textsuperscript{th} century. The
later development of linguistics, including that in West, can be
considered as a continuation of this.

In a paper ‘Modelling P\text{"a}nininian Grammar’ read in
the First Conference of SCL Peter M Scharf of Brown university
raises the problem of different interpretations of \textit{P\text{"a}nini\text{"a}m}. The
possibility of different contradictory interpretations for a scientific
truth is not possible, if it is well settled. As he rightly points out the
articulations of P\text{"a}nin\text{"i}an grammar, especially sutras and \textit{\text{"a}rtik\text{"a}s},
isolated from commentary are subject to ambiguities and these
ambiguities are resolved in different ways by different commentators.
Same is the case with commentaries on Pata\text{"a}jali’s \textit{Mah\text{"a}bh\text{"a}\text{"a}ya}. He
opines that before embarking on a computational implementation
many of these contradictions are to be resolved. What we find
important is his statement: ‘Indian grammatical commentaries composed in Sanskrit or the last two and a half millennia are not the only sources of Pāṇinian interpretations. Recent works in theoretical and computational linguistics can be considered as giving new interpretations.

Among the outcome of the interest triggered by Briggs are the works of Huet (2002\textsuperscript{21}, 2007\textsuperscript{22}) also in which the studies are centred around Sanskrit grammar. In a paper ‘Analysis of Sanskrit Text : Parsing and Semantic Relations’ Pawan Goyal\textsuperscript{23} et.al. present a parser that uses deterministic finite automata (DFA) for morphological analysis. They claim that the results they got have

\textsuperscript{21} G. Huet. Computational Tools for Sanskrit. Workshop on Computational Linguistics in South Asian Languages, XXIth South Asian Languages Analysis Roundatable, University of Constan


\textsuperscript{23} Pawan Goyal,Vipul Arora and Laxmidhar Behra,Proceedings of First International Symposium on SCL,INRIA,2007
given confidence to analyse any Sanskrit text unambiguously, though they end the paper with questions unanswered.

Amba Kulkarny et.al (2010) 24 have pointed out the limitations of a grammar based parser. What can be extracted from a language string alone without using any extra linguistic information are the syntactic semantic relations or kāraka relations and not the pure semantic relations. The reason as pointed out by them is clear: a generative grammar of any language provides rules for generation. For analysis, we require a mechanism by which, we can use these rules in a reverse way. To quote the example given by them, the product of three and four is twelve, but the reverse process (factorisation) does not give a unique answer.

There are four factors involved in a proper cognition —expectancy, mutual compatibility, proximity and

intention of the speaker. Kulkarny et.al. discuss how the first three factors are used in the rejection of non—solutions from among the several possibilities. They have not been able to deal with the fourth factor— but ‘intention of the speaker’ is the cause for the speech! But according to Bhartṛhary himself a speaker can seldom communicate through words all that he intended to and the hearer understands more or at times less than what he hears.

There have been criticisms of the view that Sanskrit is a structured language. In a paper ‘Towards A Syntactic Categorisation of Indian Theories of Language’ Houben\(^{25}\) cast doubt on the oft-cited words of Sir William Jones: ‘Sanskrit language whatever may be its antiquity, is of a wonderful structure’. He says that there is no linguistic structure before hand in the language; it is rather the linguist or grammarian who imposes structure in his

\(^{25}\) Jan.E.M.Houben, 15\(^{th}\) World Sanskrit Conference, New Delhi, 2012
description. He gives three reasons based on Bhartṛhari’s Vākyapadīya:

1) Bhartṛhary denies the reality of elements that should be central in a supposed structure in a language.

2) Words and sentences can be analysed and explained in several ways and hence the parts used to explain the whole have no definitive status.

3) In the case of prākṛta or apabhramśā it is only the individual words that are substandard and there is no structural or systemic change from Sanskrit to prākṛta.

He finds evidence for this from another work of Bhartṛhary, Mahābhāṣya Dīpika. Bhartṛhary here finds occasion to give his view on the phonetic basis of Sanskrit and does not accept a structure given beforehand.

But it is to be noted that giving a particular
structure is a possibility only for the convenience of analysis. Synthesis and analysis are not strictly reverse processes. The best example is any living body.

Hauben himself has given enough examples with the sentence\textsuperscript{26} ‘\textit{Caitra cooks rice}’.

Grammarians like Nāgeśa Bhaṭṭa take the verb as important. \textit{Kriyā} is the action of the verb in the sentence. \textit{Kārakās} are the other words which are ‘factors in the action’. The grammarians may give the following analytical description:

‘It is the activity of cooking, taking place in the present time, having an agent identical with \textit{Caitra}, having an object identical with rice.’

For the Mīmāṃsā thinkers also the verb is the

\textsuperscript{26} Houben, Semantic in the Sanskrit tradition on the eve of Colonialism, Project report, Leiden University, 2002
central element in a sentence. But for them the basic meaning of all verbs is a creative urge which stimulates action. This basic urge is expressed by the verbal ending and the verbal root merely qualifies this creative urge. Thus according to them the description of the sentence is as follows:

‘It is the creative urge which is conducive to cooking, taking place in the present time, having the same substratum as the agent residing in Caitra, having as object rice’.

In the case of Nyāya school it is the noun in the first ending or nominative that is central in a sentence. Thus the description will be as follows:

‘It is Caitra who possesses the volitional effort conducive to cooking which produces the softening and moistening which is based in rice’.

In another paper ‘Departing from Pāṇini for Good
Reason’, Huet\(^{27}\) states that ‘it is just not feasible to somehow regard Aṣātādhyāyi as a generating devise, whose inversion would yield a parsing algorithm.’ He reports a parser which is not Pāṇinīyan.

Thus there is mutual dependency of Indian Theories of syntax and semantics. It is said that the Indian linguists of the fifth century B.C. knew more of the subject than western linguists of the 19\(^{th}\) century A.D. Briggs calls the Indian scholars as ‘computer scientists without the hardware’. In this context it may be recalled that perhaps computer science is one of the fields where the technology only followed the science.

Thus about the question whether Sanskrit is a structured language Houben was partially correct and Joshy was wrong. Computational linguistics and language computing has in a way asserted the correctness of sphoṭa theory, though its total

\(^{27}\) 15\(^{th}\) World Sanskrit Conference, New Delhi, 2012
vindication had to wait for developments in mathematics, especially algebra. The graphical representation of a sentence shows the meaning of a sentence in its totality making clear the relations between the words. It can be rightly concluded that in the field of semantics and systems of knowledge representation, the ancient Sanskrit scholars were much ahead of their contemporaries elsewhere.

A fact which many of the modern scholars including Briggs have missed to specify, though made clear by their analysis, is that the classical works in Sanskrit are not language specific. One more point to be noted is that there was continuity in Indian linguistics. If Nāgeśa Bhaṭṭa of 18th century is considered as the last representative of classical Sanskrit tradition, Friedrich von Schlegel who wrote the celebrated work on the language and wisdom of Indians in 1808\textsuperscript{28} can be considered as his true successor. The

\textsuperscript{28} Friedrich von Schlegel, On the Speech And Wisdom of the Indians, Heidelverd, 1808
baton was carried forward by Franz Bopp (1791-1867), the father of comparative philology. Thus was merged the Indian linguistics with modern linguistics. The researches in the field of natural language processing (NLP), summarisation techniques and various other branches of AI are using theories of our classical linguistics.