Language, Culture and Cognition: An Introduction

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Module - 01
Introduction
Lecture - 01
Part 1: Nature of human thought

Hello and welcome to the very first module of this course: Language, Culture and Cognition: An Introduction. This is module 1, part 1, lecture 1.

This part will be basically an introduction to the course, the historical perspectives, the background information, how the field came into being all that will be covered in this first module. So, for the part 1 here is a road map. The ..this is how we will proceed. First, we will discuss about the nature of human thought; the very fundamental aspect of human thoughts and how the understanding of the same has been over centuries.

So, we will take historical perspectives from India and the Greek tradition that is basically the ancient… In the ancient world, how the understanding about human thought developed. And then, we will move on to the place of language in this particular understanding in thought and in cognition.

Again, we will look up historical records as to how these ideas were developed through centuries in various ancient civilization up to the modern time. And modern time, as we mentioned in the introduction, cognitive science came into being in the 1950s. So, that event was termed Cognitive Revolution which has shaped our understanding of language and its relationship with cognition and culture to a large extent. So, cognitive revolution deserves an analysis on its own.

So, we will look at cognitive revolution after that and then, we move on to what is cognition; what are the definitional aspects of it; what does it cover and so on, and then, we will move on to language and its place in symbolic cognition. As in cognitive science has had its own trajectory of development, there are many branches of it. Initial understanding of cognition, initial understanding of human mind and its working have changed a lot over the last few decades.

So, we will look at first the symbolic cognition and how language is placed within symbolic cognitive understanding of the human mind. And then, there are some issues with symbolic cognition as far as language is concerned. There are disagreements, there are debates, there are controversies, we will look at those challenges that cognitive science faced in terms of symbolic cognition and its relationship with language.

And then, while doing so, we will discuss some of the greatest thinkers of the time and how they tackled with this situation and then, we will move on to the embodied understanding of cognition and how language is placed within this particular domain. And then, we will move on to the fundamental aspects of embodied cognition as far as language is concerned which takes into account perception, action and their relationship with language.

So, this is the roadmap that we will follow and we will come to the modern time as to how language and its relationship with culture and cognition actually shaped up.

So, to understand any domain of knowledge, to understand any discipline, one needs to go back to the history, how did it develop into what it is today; needless to say the same will be done here as well. So, we will look at the nature of human thought as it developed over centuries of human endeavour.

Now, the cognition, the word cognition, is relatively new. It has been used only for few decades now or maybe probably a few couple of centuries, not older than that. However, the fundamental understanding of cognition which means the acquisition of knowledge, how we acquire knowledge and how we utilize this knowledge in our day-to-day life, this fundamental understanding has been around for a very very long time.

Cognition in terms of the in terms of its reference to the working of the human mind has been around for a very long time. Scholars from time immemorial have been intrigued about the nature of human thought, how does the human brain work, how do we know, what is the subject matter of knowledge and so on, has always intrigued the scholars from ancient times.

In fact, this has these ideas, these questions, have been the primary questions that the philosophers, the oldest philosophers have always asked. In fact, the philosophers are

called the first cognitive scientists, the oldest cognitive scientists. So, that is how far back this goes.

As far as ancient, if we look at if we talk about ancient civilizations and their understanding, we, one of the ancient civilizations is the Indian tradition - the Hindu civilization, the Indic civilization. So, in this civilization in Indian tradition, we see there is a distinction made between *jnana* and *vigyana*. These two kinds of knowledge are the knowledge of the perceptible facts of the world, that is out there in the world. However, there is a difference between these two kinds of knowledge systems.

jnana is *bahirmukhi* (focused on the outside); it can be acquired through senses, the knowledge that we acquire through senses like your eyes is *jnana.* On the other hand, *vigyana* is the knowledge that needs an introspection, that needs *drishti* as opposed to *seeing*, as opposed to vision, and it needs *sadhana*, basically meaning introspection, that is something that is already there inside you, you need to understand it, you need to introspect to get there.

Similarly, *vidya* also has been divided into *paravidya* and *aparavidya* as far as upanishads are concerned. So, *paravidya* is a knowledge of the ultimate, the Brahman that is the realm of metaphysical. On the other hand, *aparavidya* is the knowledge of the worldly domain, that is something that is at the level of day-to-day life, regular life.

So, there is a distinction between what is everyday life and what is metaphysical, what is higher, what is transcendental. In the Jain tradition, again there is a distinction made on similar lines. So, the distinction between *pratyaksha jnana* and *paroksha jnana*. Again, the similar kind of distinction we see; *jnana* that is knowledge, based on senses as opposed to knowledge based on reasoning, knowledge based on transcendental facts, the metaphysical world and so on.

So, there is a clear distinction between what can be achieved, what kind of knowledge can be achieved through senses and what kind of knowledge needs introspection, higher order thinking.

Similar distinctions were made by the Greek philosophers as well. Greek philosophers can be divided into Pre-Socratic and Post-Socratic philosophers. In the Greek tradition of

Pre-Socratic philosophers, we see similar kind of distinction made into knowledge of the worldly affair and knowledge of the transcendental.

Here, I have added a few names of the most important scholars in the Pre-Socratic era. You can see some of them of course, talked about the fundamental aspect of the universe and the debate on those fundamental aspect. For example, somebody said it is the water, somebody said is the air and so on.

Pythagoras for example, said number and mathematics is fundamental, because it has no end and we will see Pythagoras has been revisited in the modern times even in the age of cognitive science. So, it goes back, the understanding of human knowledge and how we arrive at human knowledge actually goes back very very long time.

And then, we also see that Protagoras takes a stand that man is the measure of all things, probably bringing in the idea of relativity for the very first time. And then of course, there are many others. For example, one *no such thing as knowledge, there is only opinion* that is also a standpoint taken by another philosopher.

So, there is nothing human have humans are limited in their capacity. So, you cannot really achieve true knowledge, real knowledge that is beyond human. You can only have opinion. That is the limitation of humans and so on. It goes on like this; mean there are many many stand points.

And then, we go on to the Post Socratic Greek philosophers. Of course, the name of Plato's looms very very large. Plato is relevant even today. As per Plato, purest forms of knowledge was already implanted in every human being. It does not have to be created, it is already there. Every human being is born with the purest form of knowledge.

The task is to bring it out in the into the realm of consciousness. This is what we see in Meno, where that the dialogue between Socrates and the boy and the slave boy, brings out this particular understanding of knowledge. The boy already has the knowledge about geometry, about mathematics and so on, already in him. The task of the interlocutor is to bring out that knowledge. So, knowledge is already there. You are born with knowledge.

In a very interesting discussion, you can see this this goes on how do you know what is knowledge, how do you even know when you find it because you do not know what it is and so on. So, this kind of discussions have been part of Greek philosophy for a very long time, the nature of knowledge and where knowledge resides; is it in the mind or is it beyond or is it within consciousness or outside of it and so on.

And then, in Republic, Plato puts forward the theory of 'tripartite soul or psyche' as he calls it. The soul is, at least logically, divided into three parts. There you see reason, spirit and desire. So, you see, reason is a separate entity even within the basic human psyche, basic human what we he calls soul. Reason is, however, responsible for rational thought. As far as spirit and appetite or desire is concerned, they are not capable of creating rational thought. Rational thought depends on reason alone.

We will move on to Aristotle, as a course as a matter of course and Aristotle however, takes a slightly different take on this idea of knowledge. He agrees that humans are desirous of knowledge. Observation through senses allows understanding of appearances. So, Aristotle gives some importance to the senses. The input, the sensory input that humans get from the universe, gives us an idea about the appearances of things in the world.

Of course, understanding takes place in the mind; but it also needs the help of the information acquired through senses. Aristotle goes on to also delineate the four *causes* or as somebody says *becauses* of explanatory adequacy that one needs to answer in order to have full knowledge of anything; in fact, he says how do you know that you know something? In order to understand that question, you have to answer the four *becauses* of the particular event.

So, as far as the older traditions are concerned in the Greek philosophy, Plato says that only reason is enough; Aristotle does give some importance to senses. In the later ages, the Greek's theories about the nature of knowledge continued to reverberate through western intellectual tradition through ages.

In fact, the Greek tradition have informed and enriched the in western tradition, western intellectual tradition. In the middle ages, the questions about knowledge were in the

purview of theologians. So, in the starting with the Greek, when the understanding of knowledge, understanding the of how we arrive at knowledge, how we know what a what is pure knowledge, true knowledge, wwere in the purview of philosophers over a period of time, things changed, the world changed and theologians started discussing these questions and in the from a very different perspective.

And then, during the Renaissance and enlightenment period, philosophers again took reign of the discussion and they continued the understanding, continued the research in this domain; gradually, bringing in the empirical findings from various newly emerging sciences.

During the Renaissance, during the enlightenment period in the western world, there were many new disciplines, many new sciences as they were called, came into being which depended on empirical findings, which dependent on, which depended, on data from inquiries and those inquiries, those data those empirical evidence were also included in the in this particular discipline.

The name some of the names that were very very significant that are relevant even today, we still look at their findings, we still look at their theoretical standpoint. Some of them are Descarte, Rene Descartes and Giambattista Vico, who did not, of course, agree with each other and then, we have Locke, Kant and so on. So, there are all these this is how old the discussion goes on and Descarte in the 17th century, Descarte and Vico in the 17th century are very very important as we will see shortly.

Descarte is one of the most looming figure among the rationalists. Rationalists are those people, who believe that knowledge can be acquired only through reasoning. It cannot be acquired through senses. So, Descarte is among the most pioneering figures among the rationalists. He set out to find out the basis of certain knowledge; how do you know that this is what is certain knowledge, this is what is final, true knowledge.

Now, he was aware of hallucinations and illusions and such things. If you can, he say he very pertinently asked, if the senses can be fooled, how can the knowledge gained through senses be certain. You with the senses might have been fooled, even when you are thinking you have gained some knowledge through it.

So, it has to be reason. It has to be devoid of the emotional bondages. It has to be reason and that alone will take us to certain knowledge. Mind must be separate from the body, mind does not and should not interact with the body. This is the famous Cartesian Dualism, the mind-body problem as it came to be known much later and this Cartesian dualism, we will come back to every now and then, in this course.

So, as you can see from this very brief introduction to the background of how the knowledge system, how the inquiry into human knowledge and *how the human mind generates knowledge* is concerned, there are primarily two schools of thought as of now as to how true knowledge can be acquired.

So, roles of senses and experiences Vs. the role of reason, logic and certainty. On the basis of this, we have two schools; one is called the rationalist, the other is called the empiricists and these are some of the most famous proponents of this theory; from some of the most famous names in these two schools. We have Plato, Descarte and Kant and one in rationalists and in empiricists, you have Aristotle, Locke, Hume, Mill and so on and logical positivists.

These two themes have recurred in history for centuries. As we have seen, starting from the Indian tradition, going to the Greek tradition, coming to the European tradition, in the Renaissance and in the during the intellectual developments, in during the 17th century onwards, we see that the two themes have remained more or less the same; more or less this this have been repeated over and over again.

So, rationalists believing that mind has the power of reasoning, which it imposes on the world of sensory experience. On the other hand, rationalists (error: should be: empiricists) insisting that that mental either reflects or are constructed on the basis of sensory inputs. So, the mind, the understanding the knowledge system is based on sensory inputs. So, these are the two.

Thus, there is a continuity of the central question of the human mind since a really really long time. Only now cognitive scientists depend on empirical methods, for testing their hypothesis regarding the same; because in the initial times, in the initial days, there was the when it was philosophers looking at the question, there was no empirical evidence.

However, now we have, now things have changed; science has taken giant leaps and with the advent of cognitive science, of course we have a lot of new machineries to look into empirical evidence. So, now we have a different mechanism to look at the same question in the modern age.

Before we move on further into the finer and into the smaller aspects of it, into the details of it, let us talk about language. How the understanding of language, how the what is the role of language in thought process, what is the role of language in cognition, how important has language been for philosophers, for thinkers, for scholars over the ages, we will look at it in short.

Again, we go back to the ancient civilizations, we have available data from Indian tradition as well as Greek tradition. So, in the ancient Vedic texts of India, which are among the oldest available texts in the world, distinction was made between language directed towards Gods and language for mundane use.

In the initial stages, in the Vedic time, language is not really taken in terms of cognition. However, we are looking at language from perspective of religious relevance as well as for mundane day to day life. Language was bestowed the power to invoke the Gods. Now, the Gods had to be pleased through the use of prayers.

So, though it is the Gods who would fulfil the worshiper's wishes, it is the language of the prayer and the priests that made it possible. As a result of which language, one particular aspect of language had almost become God like. So, it led to the deification of language and eventually giving rise to what we see as the Goddess of language, the vak-devi.

On the other hand, of course, we have the mundane language. In a slightly later tradition, Vedic tradition of the Brahmanas, the significance of language takes a very different turn. Now, the belief system changes and since the understanding is that the since Brahman, the ultimate creative force is beyond human language, is beyond human characterization, we cannot really characterize it. It is beyond our power and hence, no language can reach it directly.

Knowledge contained in language is inadequate, to reach the Brahmana, which is characterized by silence. So, in this time, during this time, the understanding of language

changes significantly and only a syllable, the syllable OM, gets some kind of a sacred status and it is understood that it represents the sound. OM represents the creative force behind the creation of universe. So, this is a important change in in course of time.

Even later, during the during about 400 BCE, there were famous grammarians Panini, Patanjali, Katyayana and others, were creating, writing grammars and writing treaties on languages and so on. At this time, we see there is a shift of attention to the in terms of language in terms of language meaning and its representation.

So, we have shifted from the godly aspects of language to the more mundane aspects of language in terms of meaning and how it is represented. So, they actually this is when the philosophical understanding of language starts to emerge in Indian tradition. So, Patanjali's Mahabhasya discusses the debate about the nature of word meaning and it comes to the conclusion that a word refers to the individual referent as well as the category of to which that individual referent belongs.

For example, the word *parrot* represents not only a parrot, a particular individual entity called a particular parrot, but it also represents the parrot-ness of that entity. This is how this is the standpoint of Patanjali. This early philosophical debate gets expanded and argued in the later tradition of the Nyaya-Vaisesikas and the Mimamsakas.

There are also series of arguments as to whether words are sequences of sounds. And why it cannot be, as per Katyayana. The understanding is that once you have pronounced a particular sound, it is gone forever, when it is replaced by another sound and it is followed by another sound and so on.

So, how do you see the whole word at the same time? It cannot how it is not possible to have words to be a sequence of sounds; but Patanjali finds a way around this problem by using his ideas of mental storage of comprehension, perhaps the first among grammarians to talk about mental storage, as far as comprehension is concerned.

A little later Bhartrhari in the 400 CE contributed towards philosophical understanding of both structure and function of language. So, in his Vakyapadiya, he claims that language constitutes the ultimate principle of reality, *shabdabrahman*. What we see in Bhartrhari actually comes back to us in the modern times in slightly different form.

Bhartrhari assigns primacy to sentence, both in structure and in meaning. So, he says according to his theory a sentence is understood as a whole, not word by word, not after not we do not understand word by word, we understand the whole sentence at one go. That is what that is the that is the strong departure from Mahabhasya.

However, again as is the nature of scholarly pursuits, there are debates on this and then his ideas are later on discarded and it is largely rejected by the later schools of philosophy and as well as by later grammarians like Kaunda Bhatta and Nagesa Bhatta and there are many more new theories that take its place.

So, basically it shows the Indian tradition basically reflects that from the beginning, there was there is the language has been taken very seriously and language has been looked at as far as its power and how it represents thought and so on.

Now, we move on to the Greek tradition. Plato was of the opinion that thought and language, thought and knowledge can be independent of language. Because ultimately as we have seen, it is reason alone that can take us to certain knowledge.

Words can merely help the hearer recollect what he already knows since humans are born with all the knowledge that is there, that is possible, all the possible knowledge. Knowledge internal and knowledge is inbuilt, it is eternal. On the other hand, Sophists by virtue of their command of rhetoric to influence opinions, relied heavily on language and they were as a result of which they were criticized. Socrates had more in common with sophists than with Plato and Aristotle because he too depended on and advocated about the power of language.

In modern times, until Frege, language would be discussed in connection with philosophical speculations, like meaning, understanding, reference, and truth, like we have seen in the Indian tradition as well as Greek tradition. So, as far as language is concerned, the primary questions to be asked was *how what is the relationship between words and meaning; how is it represented; how what does it refer* to and so on.

However, these were not discussed with relation to topics like knowledge, mind, substance and time and so on, which are considered unrelated to language. They are not part of integral part of language; but they are outside of language and this discussion was not very common before Frege's time. In the modern world, philosophers have often

engaged with the issue of language as one of the central themes, although they often disagreed on how this influence works.

But the fundamental understanding that language has some connection with the mental mechanisms, has been sort of constant ever since the time of Frege and Russell. Frege and Russell, are in fact, credited with initiating the turn, linguistic turn in Anglo American philosophical understanding of human mind. So, they gave a lot of importance to language.

Frege for example, showed that the fundamental advances in mathematics could be made by studying the language used to express mathematical thought. One must take a pause here and understand the difference between the language that Frege is talking about and the language of everyday life. Frege is not interested in everyday ordinary language, he is talking about the logical language; a language that is reasonable, that is that can be used for expressing mathematical thought.

It is the mathematical language, the logical language. So, for Frege and Russell, the propositions of logic and mathematics are pristinely independent of sense experience. So, here we see a repeat of the understanding of language, of understanding of reason and its role in getting creating knowledge. So, even when they are looking at language, they are looking at a language that is devoid of the sensory experiences.

Depending for their truth only on the structures of the abstract world they describe; a world made accessible to human beings through the light of pure reason. So, language as long as it is reflecting pure reason, as far as it is reflecting logic in its purest form, is relevant for thought not the language of everyday life, that is dependent on sensory experiences that is the standpoint that we see here.

Because Frege's main interest was to create an artificial formal language that is suitable for mathematics and logic, both. As a result of which it has to be a language that is logically perfect. Natural language, as far as Frege is concerned, is too vague and it is not good enough and it is too vague and ambiguous in fact for the purpose of logic. However, he agrees that some aspects of natural language, probably in parts, can be said to be logical as well; but largely it is not.

Russell on the other hand, has taken a stronger position and he says that language is transparent. It has it is just a medium that can be used without giving it much thought. It is just a medium.

Now, we look at Ludwig Wittgenstein, one of the one of the foremost philosophers of our times of in the understanding of human thought, human knowledge system and so on. Wittgenstein is specifically interesting because he took two different stand points during his in his own lifetime. In the initial his initial understanding that is reflected in Tractatus as it is formally as it is commonly understood and commonly called, he talks about language in terms of a picture, he talks about picture theory of language.

Language merely represents the world by depicting it. It just refers, it just gives a picture of the things in life and it just reflects it into the brain. It does not create anything, it has no other role to play. So, propositions are basically pictures of facts as it happens in real life, right. Words are names of objects. So, there is something that happens in the world, language simply takes a picture of it and depicts it in the human brain.

Thus, language simply provides a way of looking through the structure of the world. However, ordinary language that does not follow the logical construction are senseless, they do not make much sense and they are not useful as far as understanding and thought and human mind is concerned. He treated language and meaning as independent of how ordinary use, ordinary humans use them.

However, he takes a very he himself changes his opinion towards the in the second part of his life, in the later part of his life and as we see in *philosophical investigations* that his later philosophy represents a complete repudiation of the notion of an ideal language. So, initially, he was talking about an ideal language that reflects the world as it is. There is no other, there is no distraction.

It is simply a picture that gives a picture of the world as it is, factually, ideal language; kind of logical language. Now, he says there is no direct or infallible foundation of meaning for an ideal language to make transparent. That is a strong departure. There is no definitive set of conceptual categories for an ideal language to employ.

So, there is no given world, there is no ideal conceptual category that the language simply can transfer, as it is, to the brain. Ultimately, there can be no separation between

language and life and words get meaning by the context of use which he initially rejected.

So, now, he says that language use is very important and it cannot be it cannot be separated from the use, from the context of use and the use itself and meaning must be generated through that. Later, Wittgenstein gave more weightage to language than philosophy itself. His claim was that there are no philosophical problems, only language puzzles. Karl Popper famously disagreed as any of you who are interested in language, interested in philosophy would know.

There was a lot of debate, a lot of controversy around that, lot of disagreements. However, later Wittgenstein makes a fundamental shift from the early Wittgenstein in giving context of language use a center stage. So, the new debate basically can be boiled down to this.

On the one hand, you have relation between meaning and truth of which you have proponents like early Wittgenstein, Davidson and Quine and so on. On the other hand, you have, on the other side of the debate, you have later Wittgenstein, Grice, Austen, Searle and so on who talked about meaning and use of language not truth.

So, on the one hand, you have language as a reflector of truth as it exists in the world, a pre given fact that is there. On the other hand, you have the on the other side of the debate, you have the philosophers arguing that language and meaning are more important than the truth because truth may not be fundamental; truth may not be given, it may not be objective for all conditions.

Now, we move on to a slightly later time and a very interesting time for that matter, the build-up of cognitive science; how cognitive science came into being like any new discipline that comes into being, like any new domain of knowledge that comes into being, it is the work of many many scholars, it is the work across many decades and so on.

The same happened for the emergence of cognitive sciences in the 1950s. When cognitive sciences emerged in the 1950s, the dominant theoretical standpoint was behaviourism in psychology and in language and in other domains. The two most

foremost names that started challenging this particular standpoint of behaviourism are Karl Lashley and Noam Chomsky.

Of course, there are many others; but we will see why they are important in terms of our, for our purposes, for the purpose of language. Lashley for example, said that "the problems raised by the organization of language seems to me to be characteristic of almost all other cerebral activities". Behaviourism predicted that there is a continuous stimulus response feedback loop that makes us that… that is responsible for all the behavioural output.

So, you see you learn, you make a mistake and then, you course correct and so on and if you go correct, there is a positive feedback and then, you take the next step and so on. But Lashley said that that that cannot happen for all kinds of mental mechanisms. For example, he gives the examples of behaviours, organized behaviours like playing tennis, performing a musical instrument and speaking which may not probably depend on such a loop.

Because it will be so time consuming, there is no time to really wait for the feedback and then, plan your next move and so on. This has to be already pre-planned. There has to be, he said these behaviours cannot be dependent on stimulus response system because this needs to be pre-planned and this has to be hierarchically organized. There has to be a plan and there has to be an execution down the chain.

So, it cannot be dependent on stimulus response systems and for language, the highest node in this hierarchy would be the intention behind the utterances. We do not speak in a vacuum. There are intentions, there are reasons why we speak. So, intentions are the highest nodes in that hierarchy of mental functions as far as language is concerned. And after that comes the syntax and actual production at the lower nodes. The nervous system contains an overall structure within which individual units are positioned.

Lashley's seminal paper put language firmly in the domain of mental states. Earlier, the earlier the idea was language is a stimulus response behavior. You can teach language to a child and then, the child learns to speak and so on. So, you teach them, child's makes mistakes and then, you correct the mistake and then, he learns the near the correct form of it and so on.

This is something that Lashley challenged and he says language cannot be dependent on stimulus response. It has to be already present there. So, this is his, one of the first to put language as a core mechanism of the human mental functions and which is adequately supported by the neural architecture.

Similarly, Chomsky in his paper in the Symposium on Information theory in 1956, the paper titled 'Three models of language' outlined how Shannon's information theoretic account does not apply to' natural language'. He exhibited his own approach to grammar, based on transformations. He, for the first time among linguists, set out to demonstrate that language has formal precision like mathematics.

There is an algorithmic structure, there is a fundamental structure that all languages have which he called universal grammar which humans are born with and he had he is one of the foremost critics of behaviourist theory of language learning. So, these are these thinkers, these scholars are in the background in the build-up of cognitive science, the beginning of cognitive science.

And the cognitive revolution happens in the 1950s. In the mid part of 20th century was marked with remarkable advancement. How does the how did cognitive science came into being, it was marked by it was preceded by a lot of advancement in the science of human mind, in the understanding of the science of human mind. In the beginning of AI, the birth of AI, computer science, giant steps taken by neurosciences….all these developments were already building up a new discipline.

On the human sciences side, psychology was going through changes in very very important ways. Earlier key issues of mental faculty were issued were addressed by introspection method followed by behaviorism. During this time, during the run up to cognitive revolution behaviorism was challenged severely as we have just seen in Lashley and Chomsky's work, but there were many others also.

So, behaviorism faced a lot of challenges during this time. Late 1940s onward, there were some landmark conferences that actually, consciously brought together philosophers, psychologists, cognitive computer scientists, AI specialists more specifically and neuroscientists and linguists together in order to really discuss about this discuss about the possibilities of working together to look at how the human mind works.

And this is how gradually, through these conferences, a new discipline named cognitive science emerged. For one, these conferences brought together stakeholders from so many disciplines who agreed upon the fundamental fact that human mind needs to be understood with empirical evidence and there needs to be a collaborative work between disciplines to really understand the final mechanisms and that is why it is the cognitive science is an essentially interdisciplinary domain.

So, these are some of the conferences, some of the funds that actually organized those conferences. One of them was Hixon Fund that had this conference is called cerebral mechanisms of in behavior, then we had Symposium on information theory and then, of course, the Macy conferences. These were extremely important, these were instrumental in ultimately the emergence of cognitive science as a discipline.

Now, once cognitive science as a discipline has already emerged, now there are new definitions, there are new ways, new way of framing the fundamental questions of cognition. So, what is cognition? The primary subject matter of cognitive science is cognition. It refers to knowing, the collection of mental processes and activities used in thinking, understanding, perceiving, learning and remembering.

And of course, the act of using these processes. And by now, this the crucial subjects in these domains irrefutably are the following: Learning and memory, thinking and reasoning, language, decision, vision-perception, social cognition, dreaming consciousness and so on.

Within cognitive science, there were different trajectories of development. In the initial part, in the initial years, the symbolic cognition or standard cognitive science was the most important one the primary that was the primary standpoint. So, the primary theoretical position it takes is that human thought is symbolic and the processes of human mind are analogous to that of a computer.

This is because.. this happened because the fundamental force that drove the beginning of cognitive science was the necessity… to necessity for from the perspective of artificial intelligence, AI. Artificial intelligence tried to create a computer that thinks and works like the human brain.

Now, if you want to create a machine that works like the human brain, you need to understand the human brain first. So, the analogy between the human brain and the computer basically was at the forefront of various kinds of inquiries during this time. The mind is as a result of which the mind came to be thought of as a symbol system and cognition is abstract, arbitrary and is just a symbol manipulating system.

So, everything that you do, everything that cognition includes, for example all these learning, memory, thinking, reasoning, language, vision, perception, everything is ultimately a symbol manipulating systems. The mind has symbols and it manipulates those symbols with respect to various kinds of goal that we have in our at a given point of time. So, even the process that involves sensory organs controlled by neural signals are simply a type of symbol manipulating system.

So, what are symbols? Naturally, if the mind is a symbol manipulating system, it has to have symbols. So, what are basically symbols? Symbols are a set of physical, arbitrary tokens, it can be anything, it can be a sketches of on a paper, holes on a tape, even events in a digital computer and so and so forth which have to be, which need to be manipulated by a set of rules.

Those rules are fixed, there cannot be too much of there cannot be any deviation from those fixed rules, they are explicit and they are fixed. Similarly, words and numbers are also symbols. Symbol stand for something. Symbol basically means it stands for something. So, words are symbols in the way that a word like ‘Elephant’ stands for a large animal, with certain particular features.

So, one once we say elephant, it means something. It is some there is something out there that for which it stands. Similarly, number 12 stands for number 12 and so on. Symbols can combine as per fixed rules to create a new symbol. So, if we combine various symbols, meaning various words like ‘I’, ‘saw’, ‘an’, ‘elephant’, we combine them in terms of some fixed rule and then, we create a new symbol ‘I saw an elephant’.

The same rule prohibits a situation like a new creation of a new symbol like ‘elephant saw I an’ which means that the rules are fixed, rules are there are legal operations and there are illegal operations, that is, the correct operation and incorrect operation. So, the rule your rule govern phenomena of the symbol manipulating system gives us only ‘I

saw an elephant' and it does not give us 'elephants saw I an'. So, I. So, this is how the symbol manipulating system works in terms of language.

Thinking involves operations on words in an internal language. So, when we think, there is an internal language in the like the logical language that we that was talked about by Frege and Russell and many others. So, there is an internal language in our brain with which we think and that language the that language follows a certain set of rules.

In other words, cognition relies on language as far as this particular standpoint is concerned. Another important issue about language in symbolic cognition is the feature of arbitrary relationship between words and their meanings. Words stand for something that we have already seen.

So, the word like 'elephant' stands for a particular animal in the real world. However, there is no reason as to why that particular animal should be called an elephant; that means, the word its elephant itself has nothing 'elephant-like' so to say. So, the word does not have four legs, it does not have tusk, does not have a trunk, and so on. So, that particular match between the word, the symbol and the and the entity that it symbolizes that that relationship is arbitrary.

Similarly, neurons can also be thought of as symbols as they stand for the processes. Every neuronal group stand for a process, they are activated when a process is a mental function is going on. And various neurons and groups of neurons that code for one concept can be combined with other such groups to in order to create a new concept in order to form a new concept. So, that way, neurons can also be thought of as symbols.

And the entire process, entire computation between the input and output, so the input of the various kinds of information that we have and the output that the brain gives, this entire process happens inside the human brain; inside the mind of the human agent by simply manipulating those very symbols, neuronal architecture, the neural underpinning or this language and so on.

Hence, since it is an entirely an internal affair, the outside world has no role to play in this entire mechanism, in this entire computation of thought process using language and

so on and the neural architecture, there is no role of the external world on this. This is very significant point that the symbolic cognition makes. So, it is an internal affair, entirely dependent on the symbol manipulation.

Thank you.