

Fundamentals of language Acquisition

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Week 01

Lecture 02

Lec 2: Evolution, biological markers

Hello, welcome back. We will start with Lecture 2 today. In Lecture 2, we will focus on evolution. Now in this course, when we talk about evolution, we will primarily be talking about, of course, the evolution of language. Now the evolution of language has been utilized in various domains of research within this broader area in two ways. One is the ultimate origin of language, such as how language evolved from the time of our primate days, how language started in the first place, and secondly, the gradual evolution of language over time, which is the constant and ongoing change that occurs over a period, as I mentioned in the previous lecture in terms of diachronic changes.

So, we will be looking at both of these in this course. However, right now we will look at the origins. the basic origin more. And eventually, as we discuss the cultural origins of language, we will focus a little bit more on the gradual evolution of language.

Now, the role of evolution in terms of understanding human life on Earth, or for that matter any kind of life on Earth, is invaluable, as you all are already aware. So much so that it was said that nothing in biology makes sense except in the light of evolution. So, that is already a well-established fact of the matter in biological sciences that we need to understand today's biological entities in terms of how they evolved. Now, the same has been said about language as well. In fact, a parallel has been drawn by many researchers; one of them, for example, Givón, said that language, too, makes sense in the light of evolution.

He says that, like other biological phenomena, language cannot be fully understood without reference to evolution, whether proven or hypothesized. Now, this proven or hypothesized point is where the entire debate and controversy lies, and that is what we will

be unearthing today. Now, the problem with going back in time with respect to language is that language does not have a recorded fossil. So, when you are looking at other kinds of biological entities, you have to find fossils, your own records, skulls, bones, and so on; from there, you reconstruct. But language is something abstract; as a result, you do not have fossil records.

And at the same time, we can think of written records, such as cave paintings and so on, but those records started much later. Arguably, written forms of language, from pictographs onward, came much later than spoken language. Hence, that is also not very helpful in understanding how this all came about. As a result of the paucity of concrete evidence in comparison with biological entities, the entire controversy lies there. So, let us look at all of them.

There are a few questions on the basis of which we will try to structure this entire argument. So, these questions are: the first question is, should we study language evolution or not? Believe it or not, even this has been a controversial issue. Should it be studied at all? Is it at all meaningful to study language evolution, or should we just leave it as is? That has actually been a debate for centuries. And the second question is whether we should understand it, whether we should look at this question, and what we should be focusing on. Out of that, two questions primarily emerged: one is when human language evolved, meaning how old it is, and what is the time frame of the languages in the sense we understand today? Secondly, how did it appear? Was it a sudden appearance, or did it appear gradually? So, was there one fine day when language appeared and humans started speaking, or was there an evolution in terms of other precursors to language that eventually became the language we know today? These are the two primary domains of questions, and each of these has been a really contentious issue.

One of the main reasons, as we have also mentioned before, is that the paucity of concrete, tangible evidence creates the larger part of the controversy. Often, because of the lack of evidence, you have more speculations when you lack evidence. So, that is why speculations have created a lot more trouble, and hence the debate has been as rife as ever. Now, let us start one by one. The first problem is whether to study or not.

Is it even meaningful to study the origins of language? Now, since ancient times to the Middle Ages, the evolution of language and how languages came to be have been studied in terms of theological perspectives or mostly speculative terms. So, there are mythological stories about how languages came into being, how God created language, and so forth. So, primarily, most of these are speculative terms. Now, along comes Darwin with his Origin of Species, and this is an event that impacted not only the understanding of various life forms but also reignited the entire debate about language evolution. So, he stated that if we

knew the tree of biological descent of human groups, we could extract the tree related to languages.

So he had a direct correlation between human evolution and the evolution of languages. So that if we can figure out how humans evolved, we can probably also point towards how languages evolved. Now this reignited a plethora of conjectures, not all of which were supported by scientific evidence. Remember, this is the 1800s; 1859 is precisely the time when this theory came out. And so, in the many years and decades that followed, there was much speculation.

So much so that the speculations started to become outlandish, defying logic and creating a very confusing state of affairs, that there was a decree. There was an order from the Linguistic Society of Paris in 1866 that banned inquiries into the origin of language altogether. So, you can imagine the amount of speculation that had no boundaries at all, which had, I quote, "only a few hard constraints to limit the realm of possibilities." So, this was the reason why the ban was put in place. In many other places, apart from Paris, the same kind of ban was present, but it was not officially mandated, so it was somewhat unofficial; however, the general understanding was that language evolution should not be studied.

So the primary reason for this was the speculation in the absence of scientific constraints, which was the main problem. In the 19th century, Max Müller attacked Darwin's idea of the evolution of language, saying that language is uniquely human and cannot possibly have arisen from the evolutionary process. Therefore, soon after Darwin's theory came out, Max Muller tried to argue against it, saying that this is not how language can be understood; maybe it is useful for other biological species, but not for language as much. So, because the focus of Darwinian theory was natural selection, and that was what he attacked, he said this was not possible. So, now the debate was about whether natural selection could be used.

Now, after a lot of time—almost a century later—the scholarly interest has been reignited by a very important conference titled "Origins and Evolution of Language and Speech." It was sponsored by the New York Academy of Sciences in 1975, a century earlier. By this time, in 1975, cognitive science was already in its early days; major breakthroughs were happening, neuroscience was taking giant leaps, and so on. So, now we have the scientific constraints, the scientific framework, as well as the constraints on the basis on which theories can be put forward. A short while later, in 1990, when Pinker and Bloom's landmark paper came out, it was titled "Natural Language and Natural Selection.

" This appeared in the prestigious journal Behavioral and Brain Sciences. This paper

proposes that language evolution needs to be understood in terms of biological adaptation. So, this evolved, which is something that resulted from natural selection. So, not only was Darwin's theory able to be utilized, but it was proposed that natural selection was probably the way to understand it. Following this, many influential publications have been released, and up to the present time, the debate has continued.

There are primarily two groups opposing one another. So, one group says that natural selection is not the theoretical basis on which you should understand the evolution of language. The other side says that there is no harm in looking at various theories that might answer the big questions. So, I quote one of the proponents who says, "It is very difficult to make a compelling case in favor of natural selection targeting a particular trait, which is language in our case." Of course, it is easy to spin a narrative that implicates natural selection, but biologists like Richard Lewontin, who have spent their lives constructing compelling arguments (and deconstructing just-so stories), have repeatedly pointed out that it takes a serious effort to catch natural selection in flagrante delicto.

So much so that, in the case of human cognition, one should give up trying. The whole point of giving such a long quote is to highlight how strongly this group opposes the idea of natural selection as a possible theoretical construct for understanding language evolution. But on the other hand, we have Pinker and Bloom, Jackendoff, Gill, Hurford, Dediu, Levinson, and a host of other scientists who have attributed the evolution of language to natural selection. This other group, its supporters, advocates for the coming together of specialists from diverse disciplines to test, falsify, and narrow down a number of available hypotheses. So, they say, "Why do you simply discard the idea? Let us sit together; let us have different disciplines sit together and then try to figure it out.

" So, Fitch sums up, "The field remains plagued by an unfortunate but persistent belief that scientific work on the topic of language evolution is inherently and irredeemably speculative." This prejudice is unjustified. The reason I am giving you all the quotes is to show how strongly and vehemently they oppose each other. On one hand, it is not just about which theory; the controversy goes far beyond that. And then, just as many other branches of science, like geology and cosmology, study complex historical processes buried in the past, language evolution can similarly be studied, and scientific agreement can be reached based on converging evidence.

So, the idea is that just because we are talking about something so very old, going back to antiquity, we do not even know for sure to what extent it goes back. That does not mean we should give up studying; we should give up looking at it from various perspectives; that is the point. He even disagrees with the way the opposing camp tries to disparage the hypothesis, and so forth. So, he gives his own ideas about it because the strength of any

scientific endeavor should lie in argument and hypothesis testing, not in "letting certain views run unopposed." So, this school of thought has also strongly opposed Chomsky's group, which argues that it should not be viewed from a natural selection perspective.

So, basically, now you have a sense of how vehemently the groups have argued. As of today, because of these various kinds of inputs from different disciplines, we have, in spite of reservations, a large number of studies; a lot of work has happened, and we have also seen a steep rise in the recent past, adding to the ever-growing knowledge in this domain. So, as of today, going back all the way to Darwin's time until now, a lot of changes have happened; we have progressed significantly in this area, and today most scholars agree on these few points: that languages have evolved. This is a unique system of communication, different from all other forms of animal communication. Languages developed somewhere between 2 million and 200,000 years ago; that is roughly the estimate of when we stand today.

Now, if languages did evolve, that means there was a protoform of them. So, anything that evolves has a protoform, which means its previous form. So, the earlier, more simplified form of it is. So the same logic should apply to language as well. So, in the case of language, this is called a proto-language.

So, if languages did evolve, what were the earlier forms? What were the proto-forms? That is another area of research that has seen a lot of contributions lately. The earlier forms obviously need to be simpler than the fully evolved ones. Now, studies in the field of historical linguistics and language change show that languages do change over time. So the intermediate stages before the full-blown language system came into being must have gone through various kinds of simpler stages. Now, was it vocal, or was it gestural, or was it a mixture of both vocal and gestural? We do not know for sure; there is a lot of research that has gone into it, which we will look at after some time.

Now the second question: how old or ancient is human language? Where do we start? When did it all start? Now, this is also not an easy question to answer, as I have mentioned that there have been speculations; there were earlier speculations, and now we have various kinds of research outputs and concrete evidence on which we have newer theories. Now, starting from when it all began a very long time ago, the issues of language evolution have primarily been a part of religious discourse and the theological understanding of the world. Many religious discourses around the world have looked at this issue, and primarily based on the domain—depending on which religion and which community we are talking about—the language changes, but the basic idea remains the same: that God has given us language. So, depending on the religion, God differs, and the language differs; but that is the idea. So, in the case of the Jewish tradition of Midrash, it is said that God bestowed a

language upon Adam, and that language was Hebrew.

Christian thinkers believed that if a child is left to himself or herself, he or she will start to speak Hebrew because it is the original language. In fact, the idea of Hebrew being the oldest language was so strong that there was a particular Roman emperor who carried out a sort of quasi-experiment on an entire orphanage, resulting in the deaths of all the children. That experiment was also motivated by the same question: what is the earliest language, and what is the one and only first language? That was the idea. In some cases, in some civilizations, such as Hindu philosophy, language itself is divinity. So, in this case, the divine language is Sanskrit.

So, basically, wherever you go, each community has its own way of looking at it, but language is a divine gift. So, as a result, the moment humans arrived, language came with them as well. So, that is why we call it "innate." So, the idea that language is innate to humans dates back to ancient times. However, there are also other strands of thought; there have been other strands of thought from early generations as well; it is not exactly new and also looks at a non-theological, non-mythological origin of language.

One of the most important names in this domain is Dante. All of you are already aware of Dante. So, in his Divine Comedy, he discusses the problems of changeability and arbitrariness. So, language, which is what we are talking about today, is it? So, Hockett talked about it. We all know that one of these arbitrary elements is a fundamental design feature of human languages.

So, this is something that goes back to Dante. He says that language is changeable, language is arbitrary, and that this changeability and arbitrariness are part of human language, which became the hallmark of human language after Adam's expulsion from the Garden of Eden. So, this is a problem. This was seen as a problem. Now, this is known as the second stage of religious reflection on language.

This is called the scholastic phase. In the scholastic phase, there are two stages. The first phase was when language was bestowed upon Adam, who is the primordial first human according to Judeo-Christian tradition. He spoke Hebrew. And then, after his expulsion, he continued to speak the language. However, the language then became less divine, and the connection between language and thought became somewhat arbitrary.

That is what Dante was talking about, and this is what was picked up by the scholars later on, and they all talked about how the language does not remain sort of transparent; it becomes opaque. So, from a theological perspective, this is called the veil of language. The veil of language means that it conceals the true nature of reality. Among Christian thinkers,

Augustine is an important figure who stated that after the fall of Adam, cognition based on linguistic descriptions is not reliable. This continued for a long time; as far as the connection between language and the mind is concerned, this idea persisted.

Whether language reflects reality, does not reflect reality, or obstructs reality in some sense is a matter of debate. So, because the fall from grace meant a permanent breakdown between the word and the thing to which it relates in language, Furthermore, in language itself, there is a gap between a word as a mental entity and its external articulation; consequently, linguistic communication is indirect and unreliable. So, this is the second phase of understanding language in terms of speculative and religious-theological perspectives. Now, Augustine's account treats biblical texts from a philosophical rather than a historical perspective. Now, he was not the first to do this; he also had a precursor, namely Philo of Alexandria, who started it, and this idea continued until the Middle Ages.

The main idea behind this is that a man separated from God lives in a world of illusion and imagination. As a result, this degeneration is symbolic of the cognitive and communicative decline from the time when he was in the Garden of Eden and after his expulsion to the afterlife. It was such a line of thought that eventually paved the way for studying languages in terms of their relationship with the world, while speculations about the origin of language or Adamic languages were sidelined. That was in the past until the Middle Ages, about which we are talking. This was followed by the glottogenetic thought: the naturalistic origin of language.

The seeds of this idea go back all the way to Epicurean philosophies. However, this was taken up much later in a more vigorous manner. So, most of the ancient Greeks and Romans believed that language was given to people by the gods, but there were traditions at the same time since antiquity centered around a naturalistic origin of language and a naturalistic explanation for its origin. This primarily goes back to the Epicurean tradition. Those who believe that words are created from a natural tendency to express certain emotions or concepts are correct.

Basically, there was a direct one-to-one mapping. So "onomata" was the initial word. So you express your inner thoughts and emotions through certain kinds of sounds. So that was the idea. In the middle of the late 1600s and early 1700s, Giambattista Vico supported this as well. In fact, in his *The New Science*, he presents the hypothesis that the first language, which he describes as the language of the gods, did not have a vocal form but relied on gestures, pictograms, artifacts, and religious rituals.

So, this is how it all apparently started. But we will come back to it when we discuss various theories, including gestural theories and so on. We will come back to it. In our

time, a number of estimates exist regarding when human languages originated. As of today, in the 21st century, the speculations are of two types: that it came before the Neanderthals, around the time of the Neanderthals, or after the Neanderthals disappeared. So, did the Neanderthals have language, or did they not? On that particular kind of boundary, speculation varies.

So, some scholars believe and propose that language suddenly appeared around 50,000 years ago. That is the only species of Homo sapiens that has a language. On the other hand, some propose a deeper timeline for this, claiming that Neanderthals had some form of language as well. So the entire debate around the timeline is now, as of today, based on the Neanderthal issue. Now, regarding the Neanderthal debate, I have added some references; you can go and read them in detail.

The primary idea here is that Neanderthals were the subject of a major study carried out in the Neanderthal Project, which looked at various perspectives, examined the fossil records, and explored different kinds of reconstructions to determine whether Neanderthals had language. So, the antiquity of human language often rests on the argument of whether Neanderthals had language; while many scholars do not attribute linguistic ability to Neanderthals, others do. Based on comparative evidence, the descendants of H. heidelbergensis are essentially Homo sapiens, Denisovans, and Neanderthals. So, humans, the early humans diverted; they changed from the last common ancestor.

Between the last common ancestor and the higher primates and Heidelbergensis, there was a break. So, the idea is whether language appeared when the break happened or if language appeared further down the line after the Neanderthals; that is the idea. So, the very important landmark publication in 2013, as well as in 2021, reconstructed, based on genetic and other evidence, that this group also had some form of language, if not the complex language of today; there was some kind of precursor to the language they had. So, as a result, they proposed a much longer, much older timeline for when language originated, somewhere between 400,000 and 500,000 years ago. Now, this claim is basically based on findings in genetics, skeletal morphology, the morphology of the vocal tract, infant maturation, brain size, and cultural artifacts from a large number of studies.

In fact, I have added the reference to the list, so you can go check it out. So, the claim is that Neanderthals and Denisovans had the basic genetic underpinning for recognizable modern language and speech. Some have called it pre-modern language competence; communication computation possibilities have been given various names. So, at a basic level, the genetic structure was in place during the time of the Neanderthals and Denisovans as well.

So, that is the idea. While agreeing that their speech and language would have been simpler in terms of the range of speech sounds, complexity of syntax, and size of vocabulary, etc. Now, this position has been ridiculed by many, as I have shown previously. This is what was called "just-so stories taking center stage." They simply discarded the whole idea as just-so stories. However, today, based on more evidence from archaeology and genetics, there is greater support for this view.

And so much so that when the evidence started pouring in, Chomsky and his colleagues readjusted their timeline for language. Now they say that somewhere around 200,000 years ago, language appeared, updating the previous estimate of 50,000 years. So there is some sort of agreement between the two groups. That is how old the language, the origin of languages, is. The second question is, how did it appear? How did it appear? Was it a sudden burst of inspiration one fine day, or was there some sort of long-drawn-out process through which language emerged? So, was it gradual or sudden? This is the second line of our contention.

So, some argue for a sudden appearance; this idea is based on the findings of a gene called FOXP2. So, FOXP2 was discovered in the 1990s. So, once it was discovered that there was probably a genetic underpinning to language as a skill, Then, the idea was that, fine, FOXP2 was responsible. So, whenever FOXP2 appeared first, language emerged, and this was considered to be the very human kind of tendency. So, but others propose a sequence of mutations and changes with small effects and through intermediate stages useful enough to trigger natural selection.

So, we have talked about natural selection before. So, these are the two ideas. Now, this is also not a very simple, simplistic, you know, either-or kind of argument because FOXP2 has now been found to be present, at least in some form, in Neanderthals. So, as you can see, Neanderthals are very important to our discussion. So, in any case, both arguments are based on the biological factors that are considered responsible for the emergence of language. So, within the supporters of the biological origin of language, the debate basically centers on whether natural selection could be a pathway to understanding the evolution of language.

So, was it natural selection, or was it a sudden burst of skills? This has also had its share of controversies and a lot of vehement opposition from the two groups, as we have already seen. Now, the other side of the debate is about the biological versus cultural origins of the issue. So, on the one hand, there is a biological debate that there are biological factors that gave rise to language as a skill; on the other hand, we have the cultural origin hypothesis. So, cultural origin theories primarily view language as a social skill rather than a biological property of human beings. Proponents of this theory do not undermine the biological

factors, of course, but they argue that language is much more than mere hardware.

So, we do have biological factors such as brain structure, genetic makeup, the vocal tract, and so on. They all need to be in place. However, language evolved as part of a social structure, as a social need, and so forth. So, that is the debate on cultural origins. Today, of course, we have a large body of literature in this domain that brings to light the controversies surrounding the notions of these two concepts.

So, in the following sections, we will look at these issues in detail. So, first we will look at all the biological factors, what those biological factors are on the basis of which the biological origin has been proposed, and then, within that, what the debates are. So, now before we go there, we need to understand that this is a domain that is essentially interdisciplinary. There are various approaches to the story and to the question, and they are enriched by evidence and a theoretical foundation from several disciplines. Some are new; others are old. The old ones have been around for a long time: linguistics and history are two of them.

And other such things. And today we also have technologically advanced domains like, you know, molecular medicine, molecular biology, neuroscience, and so on. So, these are some of the domains that contain approaches that have been studied, from which we have drawn our evidence and references. So, you can see archaeology, biology, linguistics, psychology, mathematical modeling, molecular biology, paleontology, comparative animal behavior, complex systems science, and so on. So, that kind of gives you an idea of how complex this idea has been and how interesting it is that so many different disciplines have looked at the issue from their own perspectives using their own theoretical and methodological finesse.

Now we will start with the biological markers. So, what are the biological markers and how do they match up? How do they really make sense in terms of how languages have evolved? So, in this domain, we will examine the biological prerequisites for language evolution. Focus will mainly be on the evolution of the physical, neurological, and individual cognitive structures required for language, as well as the debates within the biological premise of sudden versus gradual adaptation or mutual mutation of these aspects. So, these will be the primary factors within which we will understand the biological domain. Now, the biological factors in the factor analysis of language evolution take into account several structural properties of humans, such as brain morphology, vocal tract structure, genetic markers, and so on. They are primarily responsible for our having the skill in the first place; that is the idea.

So, what is the skill? Language is our focus. So, this domain relies heavily not only on the

analysis of individual understanding and the explanation of those biological features but also on how the genetic structure has probably helped the evolution of language. but also those biological factors are studied in comparison with other species. So, the comparative analysis between humans and other animals seeks to explain why only humans ended up having language, while no other animals, whether higher primates or unrelated species, possess language in the same way that we do. So, what happened? So, there will be scholars favoring biological factors who do not always agree with their finer aspects.

Now, understanding through comparison is what we will begin with. There are two ways to compare humans and nonhuman animals in terms of their biological underpinnings and capabilities to use language. So, understanding human language evolution involves comparing it with that of other primates; this results in two kinds of comparisons: one is called analogous, and the other is called homologous. Analogous structures are similar to those of other animals, but they likely developed independently under different selective pressures. So, they have similar kinds of structures, but the motivations behind them are probably different. On the other hand, we have homologous structures that are shared with our closest animal relatives through common ancestry.

So, we will go into a little detail. Analogous structures have the potential to reveal which selective pressures led to the development of language. Now, this is one domain that has been studied a lot in terms of comparing human language to birdsong. A lot of research exists, and the birds' songs are quite complex. There is a structured process to it, and they learn that there is also a structure to it.

So, drawing a parallel between birdsong and human language makes sense. Now, this parallel has been connected to sexual selection primarily in birds; this is mate selection, motivated and reinforced by specific oxytocin pathways, and so forth. So, these are the motivations in the case of birdsong. So, are they also responsible for humans evolving language? That is what we are talking about. Some other animals also have surprising parallels to human language.

For example, bee dance: direction, distance, and attractiveness to pollen sources. So, research on bee dancing shows that it is a very complex process. Depending on how the dance is performed, it refers to the direction, distance, and attractiveness of the pollen sources. So, a lot of information can be conveyed through bee dances, which can be compared in complexity to human language. Similarly, name-calling, clicks, and whistles are used by some animals to refer to specific individuals. Then these animals also show displacement and reflexivity to some degree, similar to human languages.

So, these are some other animals that languages, as communication systems, have been

studied to understand what the motivating factors of human language are. Do we share the motivating factors, or do we not? And then come the homologous structures. This study of homologies in language involves the communicative and cognitive behaviors of our closest relatives, the higher primates, such as chimpanzees, bonobos, and other kinds of monkeys. So, we compare and contrast our language capacity, our biological endowment, and their biological endowments, and so on.

Now, this can lead us to know which aspects of language were present in our common ancestors. So that is where we are talking about the Denisovans and Neanderthals as well. This helps us understand what is special about human language and what happened during evolution that resulted in our ability to speak, whereas our other relatives did not. So, the communicative behaviors of great apes have been studied a lot in this domain, haven't they? So, studies of the animal behavior of close relatives, such as chimpanzees, have proven that they also have a very complex natural communication system. So, if you have ever looked at those documentaries on chimpanzees, you know what I'm talking about. They do; they are social; they live in societies; they have a very strong social bond; and, as a result, they are a very complex communicative system as well.

So, this includes short sets of calls, facial signals, and gestures. It is a combination of various things, not just calls. So, much like us, we use our vocal tract; we also use gestures and facial features simultaneously. So much so that, if you notice, the facial features while speaking differ from culture to culture. So, the American way of speaking, including the facial structure and facial expressions, and the Indian way of speaking, are different. So, that is something that can be traced back to the chimps our common ancestors through these higher primates.

Some species of monkeys have a distinct set of calls that is also designed to deceive. So, some kinds of monkeys have developed deception, you know? So, we are not the only ones involved in this. For example, a low-ranking tufted capuchin monkey may send out a false alarm call to distract others in the troop from a high-quality food source, thereby keeping the food for itself, as found in a very important study conducted in 2009. Then there are studies on captive primates like Kanzi and Nim Chimpsky, of which all of you are probably aware. These have proven to be useful in understanding how human languages have evolved.

While Kanji showed sensitivity toward word order, Chomsky did not show any sensitivity to syntax. Why is it important? We will see later when we talk about the primacy of syntax in human language, as proposed by Chomsky. In fact, the name Nim Chimpsky is a clever play on Chomsky's name. Though such studies have been able to highlight the sophisticated use of communication among great apes, both qualitatively and quantitatively, they are no

match for human beings. However, more and more studies are being conducted to see not only if they are complicated enough but also how they have evolved, which is important for us. So, that is about the understanding of homologous and analogous comparisons between humans and other animals. So this is where we end our Lecture 2. Thank you.