Origin of language

The **origin of language** in the human species has been the topic of scholarly discussions for several centuries. There is no consensus on the origin or age of human language. The topic is difficult to study because of the lack of direct evidence. Consequently, scholars wishing to study the origins of language must draw inferences from other kinds of evidence such as the fossil record, archaeological evidence, contemporary language diversity, studies of language acquisition, and comparisons between human language and systems of communication existing among other animals (particularly other primates). Many argue that the origins of language probably relate closely to the origins of modern human behavior, but there is little agreement about the implications and directionality of this connection.

This shortage of empirical evidence has led many scholars to regard the entire topic as unsuitable for serious study. In 1866, the Linguistic Society of Parisbanned any existing or future debates on the subject, a prohibition which remained influential across much of the western world until late in the twentieth century.[1] Today, there are various hypotheses about how, why, when, and where language might have emerged.[2] Despite this, there is scarcely more agreement today than a hundred years ago, when Charles Darwin's theory of evolution by natural selection provoked a rash of armchair speculation on the topic.[3] Since the early 1990s, however, a number of linguists, archaeologists, psychologists, anthropologists, and others have attempted to address with new methods what some consider one of the hardest problems in science.[4]

Contents

Approaches

One can sub-divide approaches to the origin of language according to some underlying assumptions.[5]

- "Continuity theories" build on the idea that language exhibits so much complexity that one cannot imagine it simply appearing from nothing in its final form; therefore it must have evolved from earlier pre-linguistic systems among our primate ancestors.
- "Discontinuity theories" take the opposite approach—that language, as a unique trait which cannot be compared to anything found among non-humans, must have appeared fairly suddenly during the course of human evolution.
- Some theories see language mostly as an innate faculty—largely genetically encoded.
- Other theories regard language as a mainly cultural system—learned through social interaction.

Noam Chomsky, a prominent proponent of discontinuity theory, argues that a single chance mutation occurred in one individual in the order of 100,000 years ago, installing the language faculty (a component of the mind–brain) in "perfect" or "near-perfect" form.[6] A majority of linguistic scholars as of 2017 hold continuity-based theories, but they vary in how they envision language development. Among those who see language as mostly innate, some—notably Steven Pinker[7]—avoid speculating about specific precursors in nonhuman primates, stressing simply that the language faculty must have evolved in the usual gradual way.[8] Others in this intellectual camp—notably Ib Ulbæk[5]—hold that language evolved not from primate communication but from primate cognition, which is significantly more complex.

Those who see language as a socially learned tool of communication, such as Michael Tomasello, see it developing from the cognitively controlled aspects of primate communication, these being mostly gestural as opposed to vocal.[9][10] Where vocal precursors are concerned, many continuity theorists envisage language evolving from early human capacities for song.[11][12][13][14][15]

Transcending the continuity-versus-discontinuity divide, some scholars view the emergence of language as the consequence of some kind of social transformation[16] that, by generating unprecedented levels of public trust, liberated a genetic potential for linguistic creativity that had previously lain dormant.[17][18][19] "Ritual/speech coevolution theory" exemplifies this approach.[20][21] Scholars in this intellectual camp point to the fact that even chimpanzees and bonobos have latent symbolic capacities that they rarely—if ever—use in the wild.[22] Objecting to the sudden mutation idea, these authors argue that even if a chance mutation were to install a language organ in an evolving bipedal primate, it would be adaptively useless under all known primate social conditions. A very specific social structure—one capable of upholding unusually high levels of public accountability and trust—must have evolved before or concurrently with language to make reliance on "cheap signals" (words) an evolutionarily stable strategy.

Because the emergence of language lies so far back in human prehistory, the relevant developments have left no direct historical traces; neither can comparable processes be observed today. Despite this, the emergence of new sign languages in modern times—Nicaraguan Sign Language, for example—may potentially offer insights into the developmental stages and creative processes necessarily involved.[23] Another approach inspects early human fossils, looking for traces of physical adaptation to language use.[24][25] In some cases, when the DNA of extinct humans can be recovered, the presence or absence of genes considered to be language-relevant—FOXP2, for example—may prove informative.[26] Another approach, this time archaeological, involves invoking symbolic behavior (such as repeated ritual activity) that may leave an archaeological trace—such as mining and modifying ochre pigments for body-painting—while developing theoretical arguments to justify inferences from symbolism in general to language in particular.[27][28][29]

The time range for the evolution of language and/or its anatomical prerequisites extends, at least in principle, from the phylogenetic divergence of *Homo* (2.3 to 2.4 million years ago) from *Pan* (5 to 6 million years ago) to the emergence of full behavioral modernity some 150,000 – 50,000 years ago. Few dispute that *Australopithecus* probably lacked vocal communication significantly more sophisticated than that of great apes in general,[30] but scholarly opinions vary as to the developments since the appearance of *Homo* some 2.5 million years ago. Some scholars assume the development of primitive language-like systems (*proto-language*) as early as *Homo habilis*, while others place the development of symbolic communication only with *Homo erectus* (1.8 million years ago) or with *Homo heidelbergensis* (0.6 million years ago) and the development of language proper with *Homo sapiens*, currently estimated at less than 200,000 years ago.

Using statistical methods to estimate the time required to achieve the current spread and diversity in modern languages, Johanna Nichols—a linguist at the University of California, Berkeley—argued in 1998 that vocal languages must have begun diversifying in our species at least 100,000 years ago.[31] A further study by Q. D. Atkinson[12] suggests that successive population bottlenecks occurred as our African ancestors migrated to other areas, leading to a decrease in genetic and phenotypic diversity. Atkinson argues that these bottlenecks also affected culture and language, suggesting that the further away a particular language is from Africa, the fewer phonemes it contains. By way of evidence, Atkinson claims that today's African languages tend to have relatively large numbers of phonemes, whereas languages from areas in Oceania (the last place to which humans migrated), have relatively few. Relying heavily on Atkinson's work, a subsequent study has explored the rate at which phonemes develop naturally, comparing this rate to some of Africa's oldest languages. The results suggest that language first evolved around 350,000–150,000 years ago, which is around the time when modern *Homo sapiens* evolved.[32] Estimates of this kind are not universally accepted, but jointly considering genetic, archaeological, palaeontological and much other evidence indicates that language probably emerged somewhere in sub-Saharan Africa during the Middle Stone Age, roughly contemporaneous with the speciation of *Homo sapiens*.[33]

Language origin hypotheses

Early speculations

> I cannot doubt that language owes its origin to the imitation and modification, aided by signs and gestures, of various natural sounds, the voices of other animals, and man's own instinctive cries.
>
> — Charles Darwin, 1871. *The Descent of Man, and Selection in Relation to Sex*[34]

In 1861, historical linguist Max Müller published a list of speculative theories concerning the origins of spoken language.[35]

- **Bow-wow**. The *bow-wow* or *cuckoo* theory, which Müller attributed to the German philosopher Johann Gottfried Herder, saw early words as imitations of the cries of beasts and birds.
- **Pooh-pooh**. The *Pooh-Pooh* theory saw the first words as emotional interjections and exclamations triggered by pain, pleasure, surprise, etc.
- **Ding-dong**. Müller suggested what he called the *Ding-Dong* theory, which states that all things have a vibrating natural resonance, echoed somehow by man in his earliest words.
- **Yo-he-ho**. The *yo-he-ho* theory claims language emerged from collective rhythmic labor, the attempt to synchronize muscular effort resulting in sounds such as *heave* alternating with sounds such as *ho*.

- **Ta-ta**. This did not feature in Max Müller's list, having been proposed in 1930 by Sir Richard Paget.[36] According to the *ta-ta* theory, humans made the earliest words by tongue movements that mimicked manual gestures, rendering them audible.

Most scholars today consider all such theories not so much wrong—they occasionally offer peripheral insights—as comically naïve and irrelevant.[37][38] The problem with these theories is that they are so narrowly mechanistic. They assume that once our ancestors had stumbled upon the appropriate ingenious *mechanism* for linking sounds with meanings, language automatically evolved and changed.

Problems of reliability and deception

From the perspective of modern science, the main obstacle to the evolution of language-like communication in nature is not a mechanistic one. Rather, it is the fact that symbols—arbitrary associations of sounds or other perceptible forms with corresponding meanings—are unreliable and may well be false.[39] As the saying goes, "words are cheap".[40] The problem of reliability was not recognized at all by Darwin, Müller or the other early evolutionary theorists.

Animal vocal signals are, for the most part, intrinsically reliable. When a cat purrs, the signal constitutes direct evidence of the animal's contented state. We trust the signal, not because the cat is inclined to be honest, but because it just cannot fake that sound. Primate vocal calls may be slightly more manipulable, but they remain reliable for the same reason—because they are hard to fake.[41] Primate social intelligence is "Machiavellian"—self-serving and unconstrained by moral scruples. Monkeys and apes often attempt to deceive each other, while at the same time remaining constantly on guard against falling victim to deception themselves.[42][43] Paradoxically, it is theorized that primates' resistance to deception is what blocks the evolution of their signalling systems along language-like lines. Language is ruled out because the best way to guard against being deceived is to ignore all signals except those that are instantly verifiable. Words automatically fail this test.[20]

Words are easy to fake. Should they turn out to be lies, listeners will adapt by ignoring them in favor of hard-to-fake indices or cues. For language to work, then, listeners must be confident that those with whom they are on speaking terms are generally likely to be honest.[44] A peculiar feature of language is "displaced reference", which means reference to topics outside the currently perceptible situation. This property prevents utterances from being corroborated in the immediate "here" and "now". For this reason, language presupposes relatively high levels of mutual trust in order to become established over time as an evolutionarily stable strategy. This stability is born of a longstanding mutual trust and is what grants language its authority. A theory of the origins of language must therefore explain why humans could begin trusting cheap signals in ways that other animals apparently cannot (see signalling theory).

The 'mother tongues' hypothesis

The "mother tongues" hypothesis was proposed in 2004 as a possible solution to this problem.[45] W. Tecumseh Fitch suggested that the Darwinian principle of 'kin selection'[46] – the convergence of genetic interests between relatives – might be part of the answer. Fitch suggests that languages were originally 'mother tongues'. If language evolved initially for communication between mothers and their own biological offspring, extending later to include adult relatives as well, the interests of speakers and listeners would have tended to coincide. Fitch argues that shared genetic interests would have led to sufficient trust and cooperation for intrinsically unreliable signals – words – to become accepted as trustworthy and so begin evolving for the first time.

Critics of this theory point out that kin selection is not unique to humans.[47] Other primate mothers also share genes with their progeny, as do all other animals, so why is it only humans who speak? Furthermore, it is difficult to believe that early humans restricted linguistic communication to genetic kin: the incest taboo must have forced men and women to interact and communicate with more distant relatives. So even if we accept Fitch's initial premises, the extension of the posited 'mother tongue' networks from close relatives to more distant relatives remains unexplained.[47] Fitch argues, however, that the extended period of physical immaturity of human infants and the postnatal growth of the human brain gives the human-infant relationship a different and more extended period of intergenerational dependencythan that found in any other species.[45]

Another criticism of Fitch's theory is that language today is not predominately used to communicate to kin. While Fitch's theory can potentially explain the origin of human language it cannot explain the evolution of modern language.[45]

The 'obligatory reciprocal altruism' hypothesis

Ib Ulbæk[5] invokes another standard Darwinian principle—'reciprocal altruism'[48]—to explain the unusually high levels of intentional honesty necessary for language to evolve. 'Reciprocal altruism' can be expressed as the principle that *if you scratch my back, I'll scratch yours.* In linguistic terms, it would mean that *if you speak truthfully to me, I'll speak truthfully to you.* Ordinary Darwinian reciprocal altruism, Ulbæk points out, is a relationship established between frequently interacting individuals. For language to prevail across an entire community, however, the necessary reciprocity would have needed to be enforced universally instead of being left to individual choice. Ulbæk concludes that for language to evolve, society as a whole must have been subject to moral regulation.

Critics point out that this theory fails to explain when, how, why or by whom 'obligatory reciprocal altruism' could possibly have been enforced.[21] Various proposals have been offered to remedy this defect.[21] A further criticism is that language doesn't work on the basis of reciprocal altruism anyway. Humans in conversational groups don't withhold information to all except listeners likely to offer valuable information in return. On the contrary, they seem to want to advertise to the world their access to socially relevant information, broadcasting that information without expectation of reciprocity to anyone who will listen.[49]

The gossip and grooming hypothesis

Gossip, according to Robin Dunbar in his book *Grooming, Gossip and the Evolution of Language*, does for group-living humans what manual grooming does for other primates—it allows individuals to service their relationships and so maintain their alliances on the basis of the principle: *if you scratch my back, I'll scratch yours.* Dunbar argues that as humans began living in increasingly larger social groups, the task of manually grooming all one's friends and acquaintances became so time-consuming as to be unaffordable.[50] In response to this problem, humans developed 'a cheap and ultra-efficient form of grooming'—*vocal grooming.* To keep allies happy, one now needs only to 'groom' them with low-cost vocal sounds, servicing multiple allies simultaneously while keeping both hands free for other tasks. Vocal grooming then evolved gradually into vocal language—initially in the form of 'gossip'.[50] Dunbar's hypothesis seems to be supported by the fact that the structure of language shows adaptations to the function of narration in general.[51]

Critics of this theory point out that the very efficiency of 'vocal grooming'—the fact that words are so cheap—would have undermined its capacity to signal commitment of the kind conveyed by time-consuming and costly manual grooming.[52] A further criticism is that the theory does nothing to explain the crucial transition from vocal grooming—the production of pleasing but meaningless sounds—to the cognitive complexities of syntactical speech.

Ritual/speech coevolution

The ritual/speech coevolution theory was originally proposed by social anthropologist Roy Rappaport[17] before being elaborated by anthropologists such as Chris Knight,[20] Jerome Lewis,[53] Nick Enfield,[54] Camilla Power[44] and Ian Watts.[29] Cognitive scientist and robotics engineer Luc Steels[55] is another prominent supporter of this general approach, as is biological anthropologist/neuroscientist Terrence Deacon.[56]

These scholars argue that there can be no such thing as a 'theory of the origins of language'. This is because language is not a separate adaptation but an internal aspect of something much wider—namely, human symbolic culture as a whole.[19] Attempts to explain language independently of this wider context have spectacularly failed, say these scientists, because they are addressing a problem with no solution. Can we imagine a historian attempting to explain the emergence of credit cards independently of the wider system of which they are a part? Using a credit card makes sense only if you have a bank account institutionally recognized within a certain kind of advanced capitalist society—one where electronic communications technology and digital computers have already been invented and fraud can be detected and prevented. In much the same way, language would not work outside a specific array of social mechanisms and institutions. For example, it would not work for a nonhuman ape communicating with others in the wild. Not even the cleverest nonhuman ape could make language work under such conditions.

> Lie and alternative, inherent in language ... pose problems to any society whose structure is founded on language, which is to say all human societies. I have therefore argued that if there are to be words at all it is necessary to establish *The Word*, and that The Word is established by the invariance of liturgy.
>
> — [57]

Advocates of this school of thought point out that words are cheap. As digital hallucinations, they are intrinsically unreliable. Should an especially clever nonhuman ape, or even a group of articulate nonhuman apes, try to use words in the wild, they would carry no conviction. The primate vocalizations that do carry conviction—those they actually use—are unlike words, in that they are emotionally expressive, intrinsically meaningful and reliable because they are relatively costly and hard to fake.

Language consists of digital contrasts whose cost is essentially zero. As pure social conventions, signals of this kind cannot evolve in a Darwinian social world—they are a theoretical impossibility.[39] Being intrinsically unreliable, language works only if you can build up a reputation for trustworthiness within a certain kind of society—namely, one where symbolic cultural facts (sometimes called 'institutional facts') can be established and maintained through collective social endorsement.[58] In any hunter-gatherer society, the basic mechanism for establishing trust in symbolic cultural facts is collective *ritual*.[59] Therefore, the task facing researchers into the origins of language is more multidisciplinary than is usually supposed. It involves addressing the evolutionary emergence of human symbolic culture as a whole, with language an important but subsidiary component.

Critics of the theory include Noam Chomsky, who terms it the 'non-existence' hypothesis—a denial of the very existence of language as an object of study for natural science.[60] Chomsky's own theory is that language emerged in an instant and in perfect form,[61] prompting his critics in turn to retort that only something that does not exist—a theoretical construct or convenient scientific fiction—could possibly emerge in such a miraculous way.[18] The controversy remains unresolved.

Chomsky's single step theory

According to Chomsky's single mutation theory, the emergence of language resembled the formation of a crystal; with digital infinity as the seed crystal in a super-saturated primate brain, on the verge of blossoming into the human mind, by physical law, once evolution added a single small but crucial keystone.[62][61] Whilst some suggest it follows from this theory that language appeared rather suddenly within the history of human evolution, Chomsky, writing with computational linguist and computer scientist Robert C. Berwick, suggests it is completely compatible with modern biology. They note "none of the recent accounts of human language evolution seem to have completely grasped the shift from conventional Darwinism to its fully stochastic modern version—specifically, that there are stochastic effects not only due to sampling like directionless drift, but also due to directed stochastic variation in fitness, migration, and heritability—indeed, all the "forces" that affect individual or gene frequencies. ... All this can affect evolutionary outcomes—outcomes that as far as we can make out are not brought out in recent books on the evolution of language, yet would arise immediately in the case of any new genetic or individual innovation, precisely the kind of scenario likely to be in play when talking about language's emergence."

Citing evolutionary geneticist Svante Pääbo they concur that a substantial difference must have occurred to differentiate *Homo sapiens* from Neanderthals to "prompt the relentless spread of our species who had never crossed open water up and out of Africa and then on across the entire planet in just a few tens of thousands of years. ... What we do not see is any kind of "gradualism" in new tool technologies or innovations like fire, shelters, or figurative art." Berwick and Chomsky therefore suggest language emerged approximately between 200,000 years ago and 60,000 years ago (between the arrival of the first anatomically modern humans in southern Africa, and the last exodus from Africa, respectively). "That leaves us with about 130,000 years, or approximately 5,000–6,000 generations of time for evolutionary change. This is not 'overnight in one generation' as some have (incorrectly) inferred—but neither is it on the scale of geological eons. It's time enough—within the ballpark for what Nilsson and Pelger (1994) estimated as the time required for the full evolution of a vertebrate eye from a single cell, even without the invocation of any 'evo-devo' effects."[63]

Gestural theory

The gestural theory states that human language developed from gestures that were used for simple communication.

Two types of evidence support this theory

1. Gestural language and vocal language depend on similar neural systems. The regions on the cortex that are responsible for mouth and hand movements border each other
2. Nonhuman primates can use gestures or symbols for at least primitive communication, and some of their gestures resemble those of humans, such as the "begging posture", with the hands stretched out, which humans share with chimpanzees.[64]

Research has found strong support for the idea that verbal language and sign language depend on similar neural structures. Patients who used sign language, and who suffered from a left-hemisphere lesion, showed the same disorders with their sign language as vocal patients did with their oral language.[65] Other researchers found that the same left-hemisphere brain regions were active during sign language as during the use of vocal or written language.[66]

Primate gesture is at least partially genetic: different nonhuman apes will perform gestures characteristic of their species, even if they have never seen another ape perform that gesture. For example, gorillas beat their breasts. This shows that gestures are an intrinsic and important part of primate communication, which supports the idea that language evolved from gesture.[67]

Further evidence suggests that gesture and language are linked. In humans, manually gesturing has an effect on concurrent vocalizations, thus creating certain natural vocal associations of manual efforts. Chimpanzees move their mouths when performing fine motor tasks. These mechanisms may have played an evolutionary role in enabling the development of intentional vocal communication as a supplement to gestural communication. Voice modulation could have been prompted by preexisting manual actions.[67]

There is also the fact that, from infancy, gestures both supplement and predict speech.[68][69] This addresses the idea that gestures quickly change in humans from a sole means of communication (from a very young age) to a supplemental and predictive behavior that we use despite being able to communicate verbally. This too serves as a parallel to the idea that gestures developed first and language subsequently built upon it.

Two possible scenarios have been proposed for the development of language,[70] one of which supports the gestural theory:

1. Language developed from the calls of our ancestors.
2. Language was derived from gesture.

The first perspective that language evolved from the calls of our ancestors seems logical because both humans and animals make sounds or cries. One evolutionary reason to refute this is that, anatomically, the center that controls calls in monkeys and other animals is located in a completely different part of the brain than in humans. In monkeys, this center is located in the depths of the brain related to emotions. In the human system, it is located in an area unrelated to emotion. Humans can communicate simply to communicate—without emotions. So, anatomically, this scenario does not work.[70] Therefore, we resort to the idea that language was derived from gesture (we communicated by gesture first and sound was attached later).

The important question for gestural theories is why there was a shift to vocalization. Various explanations have been proposed:

1. Our ancestors started to use more and more tools, meaning that their hands were occupied and could no longer be used for gesturing.[71]
2. Manual gesturing requires that speakers and listeners be visible to one another. In many situations, they might need to communicate, even without visual contact—for example after nightfall or when foliage obstructs visibility
3. A composite hypothesis holds that early language took the form of part gestural and part vocal mimesis (imitative 'song-and-dance'), combining modalities because all signals (like those of nonhuman apes and monkeys) still needed to be costly in order to be intrinsically convincing. In that event, each multi-media display would have needed not just to disambiguate an intended meaning but also to inspire confidence in the signal's reliability. The suggestion is that only once community-wide contractual understandings had come into force[72] could trust in communicative intentions be automatically assumed, at last allowing *Homo sapiens* to shift to a more efficient default format. Since vocal distinctive features (sound contrasts) are ideal for this purpose, it was only at this point—when intrinsically persuasive body-language was no longer required to convey each message—that the decisive shift from manual gesture to our current primary reliance on *spoken* language occurred.[18][20][73]

A comparable hypothesis states that in 'articulate' language, gesture and vocalisation are intrinsically linked, as language evolved from equally intrinsically linked dance and song [74]. Humans still use manual and facial gestures when they speak, especially when people meet who have no language in common.[75] There are also, of course, a great number of sign languages still in existence,

commonly associated with deaf communities. These sign languages are equal in complexity, sophistication, and expressive power, to any oral language. The cognitive functions are similar and the parts of the brain used are similar. The main difference is that the "phonemes" are produced on the outside of the body, articulated with hands, body, and facial expression, rather than inside the body articulated with tongue, teeth, lips, and breathing(Compare the motor theory of speech perception)

Critics of gestural theory note that it is difficult to name serious reasons why the initial pitch-based vocal communication (which is present in primates) would be abandoned in favor of the much less effective non-vocal, gestural communication. However, Michael Corballis has pointed out that it is supposed that primate vocal communication (such as alarm calls) cannot be controlled consciously, unlike hand movement, and thus is not credible as precursor to human language; primate vocalization is rather homologous to and continued in involuntary reflexes (connected with basic human emotions) such as screams or laughter (the fact that these can be fake does not disprove the fact that genuine involuntary responses to fear or surprise exist). Also, gesture is not generally less effective, and depending on the situation can even be advantageous, for example in a loud environment or where it is important to be silent, such as on a hunt. Other challenges to the "gesture-first" theory have been presented by researchers in psycholinguistics, including David McNeill.

Tool-use associated sound in the evolution of language

Proponents of the motor theory of language evolution have primarily focused on the visual domain and communication through observation of movements. The *Tool-use sound hypothesis* suggests that the production and perception of sound, also contributed substantially, particularly *incidental sound of locomotion* (*ISOL*) and *tool-use sound* (*TUS*).[76] Human bipedalism resulted in rhythmic and more predictable *ISOL*. That may have stimulated the evolution of musical abilities, auditory working memory, and abilities to produce complex vocalizations, and to mimic natural sounds.[77] Since the human brain proficiently extracts information about objects and events from the sounds they produce, *TUS*, and mimicry of *TUS*, might have achieved an iconic function. The prevalence of sound symbolism in many extant languages supports this idea. Self-produced TUS activates multimodal brain processing (motor neurons, hearing, proprioception, touch, vision), and *TUS* stimulates primate audiovisual mirror neurons, which is likely to stimulate the development of association chains. Tool use and auditory gestures involve motor-processing of the forelimbs, which is associated with the evolution of vertebrate vocal communication. The production, perception, and mimicry of *TUS* may have resulted in a limited number of vocalizations or protowords that were associated with tool use.[78] A new way to communicate about tools, especially when out of sight, would have had selective advantage. A gradual change in acoustic properties and/or meaning could have resulted in arbitrariness and an expanded repertoire of words. Humans have been increasingly exposed to *TUS* over millions of years, coinciding with the period during which spoken language evolved.

Mirror neurons and language origins

In humans, functional MRI studies have reported finding areas homologous to the monkey mirror neuron system in the inferior frontal cortex, close to Broca's area, one of the language regions of the brain. This has led to suggestions that human language evolved from a gesture performance/understandingsystem implemented in mirror neurons. Mirror neurons have been said to have the potential to provide a mechanism for action-understanding, imitation-learning, and the simulation of other people's behavior.[79] This hypothesis is supported by some cytoarchitectonic homologies between monkey premotor area F5 and human Broca's area.[80] Rates of vocabulary expansion link to the ability of children to vocally mirror non-words and so to acquire the new word pronunciations. Such speech repetition occurs automatically, quickly[81] and separately in the brain to speech perception.[82][83] Moreover, such vocal imitation can occur without comprehension such as in speech shadowing[84] and echolalia.[80][85] Further evidence for this link comes from a recent study in which the brain activity of two participants was measured using fMRI while they were gesturing words to each other using hand gestures with a game of charades—a modality that some have suggested might represent the evolutionary precursor of human language. Analysis of the data using Granger Causality revealed that the mirror-neuron system of the observer indeed reflects the pattern of activity of in the motor system of the sender, supporting the idea that the motor concept associated with the words is indeed transmitted from one brain to another using the mirror system.[86]

Not all linguists agree with the above arguments, however. In particular, supporters of Noam Chomsky argue against the possibility that the mirror neuron system can play any role in the hierarchical recursive structures essential to syntax.[87]

Putting the baby down theory

According to Dean Falk's 'putting the baby down' theory, vocal interactions between early hominid mothers and infants sparked a sequence of events that led, eventually, to our ancestors' earliest words.[88] The basic idea is that evolving human mothers, unlike their counterparts in other primates, couldn't move around and forage with their infants clinging onto their backs. Loss of fur in the human case left infants with no means of clinging on. Frequently, therefore, mothers had to put their babies down. As a result, these babies needed to be reassured that they were not being abandoned. Mothers responded by developing 'motherese'—an infant-directed communicative system embracing facial expressions, body language, touching, patting, caressing, laughter, tickling and emotionally expressive contact calls. The argument is that language somehow developed out of all this.[88]

In *The Mental and Social Life of Babies*, psychologist Kenneth Kaye noted that no usable adult language could have evolved without interactive communication between very young children and adults. "No symbolic system could have survived from one generation to the next if it could not have been easily acquired by young children under their normal conditions of social life."[89]

Grammaticalisation theory

'Grammaticalisation' is a continuous historical process in which free-standing words develop into grammatical appendages, while these in turn become ever more specialized and grammatical. An initially 'incorrect' usage, in becoming accepted, leads to unforeseen consequences, triggering knock-on effects and extended sequences of change. Paradoxically, grammar evolves because, in the final analysis, humans care less about grammatical niceties than about making themselves understood.[90] If this is how grammar evolves today, according to this school of thought, we can legitimately infer similar principles at work among our distant ancestors, when grammar itself was first being established.[91][92][93]

In order to reconstruct the evolutionary transition from early language to languages with complex grammars, we need to know which hypothetical sequences are plausible and which are not. In order to convey abstract ideas, the first recourse of speakers is to fall back on immediately recognizable concrete imagery, very often deploying metaphors rooted in shared bodily experience.[94] A familiar example is the use of concrete terms such as 'belly' or 'back' to convey abstract meanings such as 'inside' or 'behind'. Equally metaphorical is the strategy of representing temporal patterns on the model of spatial ones. For example, English speakers might say 'It is going to rain,' modeled on 'I am going to London.' This can be abbreviated colloquially to 'It's gonna rain.' Even when in a hurry, we don't say 'I'm gonna London'—the contraction is restricted to the job of specifying tense. From such examples we can see why grammaticalization is consistently unidirectional—from concrete to abstract meaning, not the other way around.[91]

Grammaticalization theorists picture early language as simple, perhaps consisting only of nouns.[93]p. 111 Even under that extreme theoretical assumption, however, it is difficult to imagine what would realistically have prevented people from using, say, 'spear' as if it were a verb ('Spear that pig!'). Irrespective of the niceties of grammar as professional linguists understand it, people in real life would surely have used their nouns as verbs or their verbs as nouns as occasion demanded. In short, while a noun-only language might seem theoretically possible, grammaticalization theory indicates that it cannot have remained fixed in that state for any length of time.[91][95]

Creativity drives grammatical change.[95] This presupposes a certain attitude on the part of listeners. Instead of punishing deviations from accepted usage, listeners must prioritize imaginative mind-reading. Imaginative creativity—emitting a leopard alarm when no leopard was present, for example—is not the kind of behavior which, say, vervet monkeys would appreciate or reward.[96] Creativity and reliability are incompatible demands; for 'Machiavellian' primates as for animals generally, the overriding pressure is to demonstrate reliability.[97] If humans escape these constraints, it is because in our case, listeners are primarily interested in mental states.

To focus on mental states is to accept fictions—inhabitants of the imagination—as potentially informative and interesting. Take the use of metaphor. A metaphor is, literally, a false statement.[98] Think of Romeo's declaration, 'Juliet is the sun!' Juliet is a woman, not a ball of plasma in the sky, but human listeners are not (or not usually) pedants insistent on point-by-point factual accuracy. They want to know what the speaker has in mind. Grammaticalization is essentially based on metaphor. To outlaw its use would be to stop grammar from evolving and, by the same token, to exclude all possibility of expressing abstract thought.[94][99]

A criticism of all this is that while grammaticalization theory might explain language change today, it does not satisfactorily address the really difficult challenge—explaining the initial transition from primate-style communication to language as we know it. Rather, the theory assumes that language already exists. As Bernd Heine and Tania Kuteva acknowledge: "Grammaticalization requires a linguistic system that is used regularly and frequently within a community of speakers and is passed on from one group of speakers t another".[93] Outside modern humans, such conditions do not prevail.

Evolution-Progression Model

Human language is used for self-expression; however, expression displays different stages. The consciousness of self and feelings represents the stage immediately prior to the external, phonetic expression of feelings in the form of sound, i.e., language. Intelligent animals such as dolphins, Eurasian magpies, and chimpanzees live in communities, wherein they assign themselves roles for group survival and show emotions such as sympathy.[100] When such animals view their reflection (mirror test), they recognize themselves and exhibit self-consciousness.[101] Notably, humans evolved in a quite different environment than that of these animals. The human environment accommodated the development of interaction, self-expression, and tool-making as survival became easier with the advancement of tools, shelters, and fire-making.[102] The increasing brain size allowed advanced provisioning and tools and the technological advances during the Palaeolithic era that built upon the previous evolutionary innovations of bipedalism and hand versatility allowed the development of human language. In a series of interrelated steps, concentrated self-consciousness arose and human language developed.[103]

Self-domesticated ape theory

According to a study investigating the song differences between white-rumped munias and its domesticated counterpart (Bengalese finch), the wild munias use a highly stereotyped song sequence, whereas the domesticated ones sing a highly unconstrained song. In wild finches, song syntax is subject to female preference—sexual selection—and remains relatively fixed. However, in the Bengalese finch, natural selection is replaced by breeding, in this case for colorful plumage, and thus, decoupled from selective pressures, stereotyped song syntax is allowed to drift. It is replaced, supposedly within 1000 generations, by a variable and learned sequence. Wild finches, moreover, are thought incapable of learning song sequences from other finches.[104] In the field of bird vocalization, brains capable of producing only an innate song have very simple neural pathways: the primary forebrain motor center, called the robust nucleus of arcopallium, connects to midbrain vocal outputs, which in turn project to brainstem motor nuclei. By contrast, in brains capable of learning songs, the arcopallium receives input from numerous additional forebrain regions, including those involve in learning and social experience. Control over song generation has become less constrained, more distributed, and more flexible.[105]

One way to think about human evolution is that we are self-domesticated apes. Just as domestication relaxed selection for stereotypic songs in the finches—mate choice was supplanted by choices made by the aesthetic sensibilities of bird breeders and their customers—so might our cultural domestication have relaxed selection on many of our primate behavioral traits, allowing old pathways to degenerate and reconfigure. Given the highly indeterminate way that mammalian brains develop—they basically construct themselves "bottom up", with one set of neuronal interactions setting the stage for the next round of interactions—degraded pathways would tend to seek out and find new opportunities for synaptic hookups. Such inherited de-differentiations of brain pathways might have contributed to the functional complexity that characterizes human language. And, as exemplified by the finches, such de-differentiations can occur in very rapid time-frames.[106]

Speech and language for communication

A distinction can be drawn between speech and language. Language is not necessarily spoken: it might alternatively be written or signed. Speech is among a number of different methods of encoding and transmitting linguistic information, albeit arguably the most natural one.[107]

Some scholars view language as an initially cognitive development, its 'externalisation' to serve communicative purposes occurring later in human evolution. According to one such school of thought, the key feature distinguishing human language is recursion,[108] (in this context, the iterative embedding of phrases within phrases). Other scholars—notably Daniel Everett—deny that recursion is universal, citing certain languages (e.g. Pirahã) which allegedly lack this feature.[109]

The ability to ask questions is considered by some to distinguish language from non-human systems of communication.[110] Some captive primates (notably bonobos and chimpanzees), having learned to use rudimentary signing to communicate with their human trainers, proved able to respond correctly to complex questions and requests. Yet they failed to ask even the simplest questions themselves. Conversely, human children are able to ask their first questions (using only question intonation) at the babbling period of their development, long before they start using syntactic structures. Although babies from different cultures acquire native languages from their social environment, all languages of the world without exception—tonal, non-tonal, intonational and accented—use similar rising "question intonation" for yes–no questions.[111][112] This fact is a strong evidence of the universality of question intonation.

Cognitive development and language

One of the intriguing abilities that language users have is that of high-level reference (or deixis), the ability to refer to things or states of being that are not in the immediate realm of the speaker. This ability is often related to theory of mind, or an awareness of the other as a being like the self with individual wants and intentions. According to Chomsky, Hauser and Fitch (2002), there are six main aspects of this high-level reference system:

- Theory of mind
- Capacity to acquire non-linguistic conceptual representations, such as the object/kind distinction
- Referential vocal signals
- Imitation as a rational, intentional system
- Voluntary control over signal production as evidence of intentional communication
- Number representation[108]

Theory of mind

Simon Baron-Cohen (1999) argues that theory of mind must have preceded language use, based on evidence of use of the following characteristics as much as 40,000 years ago: intentional communication, repairing failed communication, teaching, intentional persuasion, intentional deception, building shared plans and goals, intentional sharing of focus or topic, and pretending. Moreover, Baron-Cohen argues that many primates show some, but not all, of these abilities. Call and Tomasello's research on chimpanzees supports this, in that individual chimps seem to understand that other chimps have awareness, knowledge, and intention, but do not seem to understand false beliefs. Many primates show some tendencies toward a theory of mind, but not a full one as humans have. Ultimately, there is some consensus within the field that a theory of mind is necessary for language use. Thus, the development of a full theory of mind in humans was a necessary precursor to full language use.

Number representation

In one particular study, rats and pigeons were required to press a button a certain number of times to get food. The animals showed very accurate distinction for numbers less than four, but as the numbers increased, the error rate increased.[108] Matsuzawa (1985) attempted to teach chimpanzees Arabic numerals. The difference between primates and humans in this regard was very large, as it took the chimps thousands of trials to learn 1–9 with each number requiring a similar amount of training time; yet, after learning the meaning of 1, 2 and 3 (and sometimes 4), children easily comprehend the value of greater integers by using a successor function (i.e. 2 is 1 greater than 1, 3 is 1 greater than 2, 4 is 1 greater than 3; once 4 is reached it seems most children have an "a-ha!" moment and understand that the value of any integer *n* is 1 greater than the previous integer). Put simply, other primates learn the meaning of numbers one by one, similar to their approach to other referential symbols, while children first learn an arbitrary list of symbols (1, 2, 3, 4...) and then later learn their precise meanings.[113] These results can be seen as evidence for the application of the "open-ended generative property" of language in human numeral cognition.[108]

Linguistic structures

Lexical-phonological principle

Hockett (1966) details a list of features regarded as essential to describing human language.[114] In the domain of the lexical-phonological principle, two features of this list are most important:

- Productivity: users can create and understand completely novel messages.
  - New messages are freely coined by blending, analogizing from, or transforming old ones.
  - Either new or old elements are freely assigned new semantic loads by circumstances and context. This says that in every language, new idioms constantly come into existence.
- Duality (of Patterning): a large number of meaningful elements are made up of a conveniently small number of independently meaningless yet message-differentiating elements.

The sound system of a language is composed of a finite set of simple phonological items. Under the specific phonotactic rules of a given language, these items can be recombined and concatenated, giving rise to morphology and the open-ended lexicon. A key feature of language is that a simple, finite set of phonological items gives rise to an infinite lexical system wherein rules determine the form of each item, and meaning is inextricably linked with form. Phonological syntax, then, is a simple combination of pre-existing phonological units. Related to this is another essential feature of human language: lexical syntax, wherein pre-existing units are combined, giving rise to semantically novel or distinct lexical items.

Certain elements of the lexical-phonological principle are known to exist outside of humans. While all (or nearly all) have been documented in some form in the natural world, very few coexist within the same species. Bird-song, singing nonhuman apes, and the songs of whales all display phonological syntax, combining units of sound into larger structures apparently devoid of enhanced or novel meaning. Certain other primate species do have simple phonological systems with units referring to entities in the world. However, in contrast to human systems, the units in these primates' systems normally occur in isolation, betraying a lack of lexical syntax. There is new evidence to suggest that Campbell's monkeys also display lexical syntax, combining two calls (a predator alarm call with a "boom", the combination of which denotes a lessened threat of danger), however it is still unclear whether this is a lexical or a morphological phenomenon.

Pidgins and creoles

Pidgins are significantly simplified languages with only rudimentary grammar and a restricted vocabulary. In their early stage pidgins mainly consist of nouns, verbs, and adjectives with few or no articles, prepositions, conjunctions or auxiliary verbs. Often the grammar has no fixed word order and the words have no inflection.[115]

If contact is maintained between the groups speaking the pidgin for long periods of time, the pidgins may become more complex over many generations. If the children of one generation adopt the pidgin as their native language it develops into a creole language, which becomes fixed and acquires a more complex grammar, with fixed phonology, syntax, morphology, and syntactic embedding. The syntax and morphology of such languages may often have local innovations not obviously derived from any of the parent languages.

Studies of creole languages around the world have suggested that they display remarkable similarities in grammar and are developed uniformly from pidgins in a single generation. These similarities are apparent even when creoles do not share any common language origins. In addition, creoles share similarities despite being developed in isolation from each other. Syntactic similarities include subject–verb–object word order. Even when creoles are derived from languages with a different word order they often develop the SVO word order. Creoles tend to have similar usage patterns for definite and indefinite articles, and similar movement rules for phrase structures even when the parent languages do not.[115]

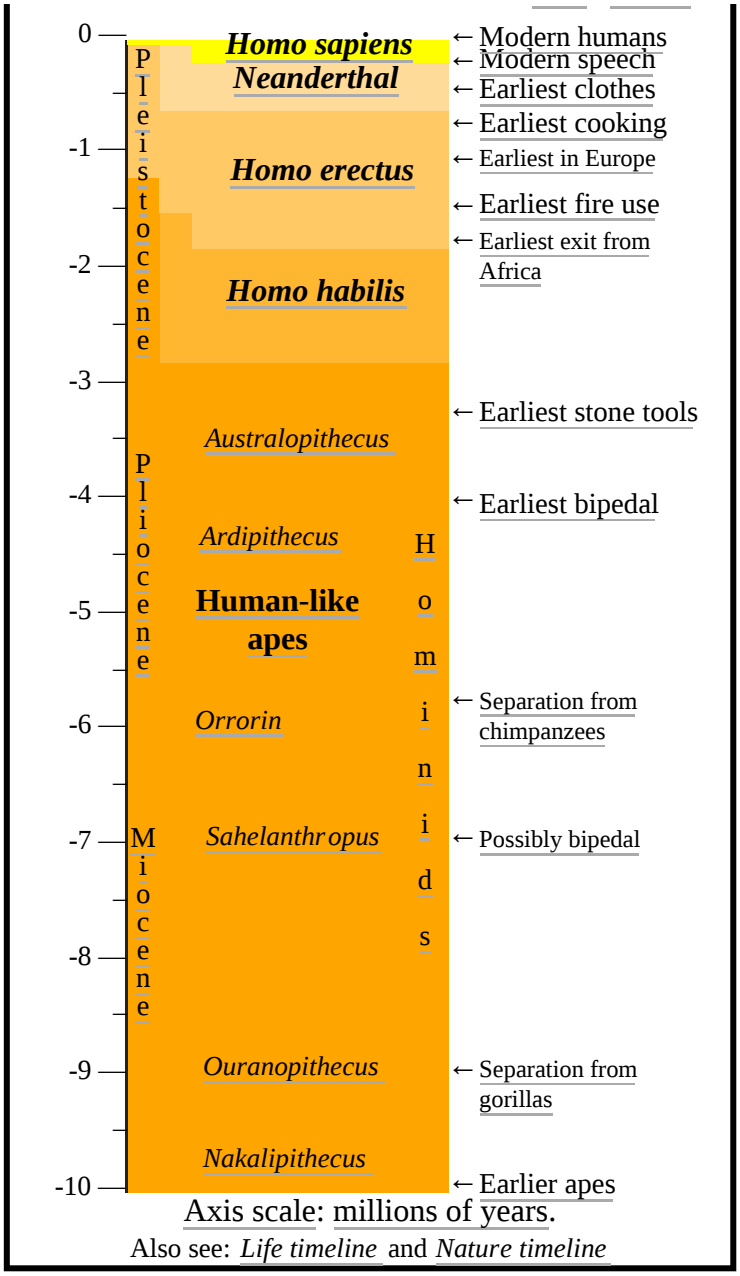
Evolutionary timeline

Human timeline

view • discuss •

Primate communication

Field primatologists can give us useful insights into great ape communication in the wild.[30] An important finding is that nonhuman primates, including the other great apes, produce calls that are graded, as opposed to categorically differentiated, with listeners striving to evaluate subtle gradations in signalers' emotional and bodily states. Nonhuman apes seemingly find it extremely difficult to produce vocalizations in the absence of the corresponding emotional states.[41] In captivity, nonhuman apes have been taught rudimentary forms of sign language or have been persuaded to use lexigrams—symbols that do not graphically resemble the corresponding words—on computer keyboards. Some nonhuman apes, such as Kanzi, have been able to learn and use hundreds of lexigrams.[116][117]



The Broca's and Wernicke's areas in the primate brain are responsible for controlling the muscles of the face, tongue, mouth, and larynx, as well as recognizing sounds. Primates are known to make "vocal calls", and these calls are generated by circuits in the brainstem and limbic system.[118]

In the wild, the communication of vervet monkeys has been the most extensively studied.[115] They are known to make up to ten different vocalizations. Many of these are used to warn other members of the group about approaching predators. They include a "leopard call", a "snake call", and an "eagle call".[119] Each call triggers a different defensive strategy in the monkeys who hear the call and scientists were able to elicit predictable responses from the monkeys using loudspeakers and prerecorded sounds. Other vocalizations may be used for identification. If an infant monkey calls, its mother turns toward it, but other vervet mothers turn instead toward that infant's mother to see what she will do.[120][121]

Similarly, researchers have demonstrated that chimpanzees (in captivity) use different "words" in reference to different foods. They recorded vocalizations that chimps made in reference, for example, to grapes, and then other chimps pointed at pictures of grapes when they heard the recorded sound.[122][123]

Ardipithecus ramidus

A study published in *Homo: Journal of Comparative Human Biology* in 2017 claims that *A.ramidus*, a hominin dated at approximately 4.5Ma, shows the first evidence of an anatomical shift in the hominin lineage suggestive of increased vocal capability.[124] This study compared the skull of *A.ramidus* with twenty nine chimpanzee skulls of different ages and found that in numerous features *A.ramidus* clustered with the infant and juvenile measures as opposed to the adult measures. Significantly, such affinity with the shape dimensions of infant and juvenile chimpanzee skull architecture was argued may have resulted in greater vocal capability. This assertion was based on the notion that the chimpanzee vocal tract ratios that prevent speech are a result of growth

factors associated with puberty - growth factors absent in *A.ramidus* ontogeny. *A.ramidus* was also found to have a degree of cervical lordosis more conducive to vocal modulation when compared with chimpanzees as well as cranial base architecture suggestive of increased vocal capability

What was significant in this study was the observation that the changes in skull architecture that correlate with reduced aggression ar the same changes necessary for the evolution of early hominin vocal ability. In integrating data on anatomical correlates of primate mating and social systems with studies of skull and vocal tract architecture that facilitate speech production, the authors argue that paleoanthropologists to date have failed to grasp the important relationship between early hominin social evolution and language capacity.

In the paleoanthropological literature, these changes in early hominin skull morphology [reduced facial prognathism and lack of canine armoury] have to date been analysed in terms of a shift in mating and social behaviour, with little consideration given to vocally mediated sociality. Similarly, in the literature on language evolution there is a distinct lacuna regarding links between craniofacial correlates of social and mating systems and vocal ability. These are surprising oversights given that pro-sociality and vocal capability require identical alterations to the common ancestral skull and skeletal configuration. We therefore propose a model which integrates data on whole organism morphogenesis with evidence for a potential early emergence of hominin socio-vocal adaptations. Consequently, we suggest vocal capability may have evolved much earlier than has been traditionally proposed. Instead of emerging in the *Homo* genus, we suggest the palaeoecological context of late Miocene and early Pliocene forests and woodlands facilitated the evolution of hominin socio-vocal capability. We also propose that paedomorphic morphogenesis of the skull via the process of self-domestication enabled increased levels of pro-social behaviour, as well as increased capacity for socially synchronous vocalisation to evolve at the base of the hominin clade.[125]

While the skull of *A.ramidus*, according to the authors, lacks the anatomical impediments to speech evident in chimpanzees, it is unclear what the vocal capabilities of this early hominin were. While they suggest *A.ramidus* - based on similar vocal tract ratios - may have had vocal capabilities equivalent to a modern human infant or very young child, they concede this is obviously a debatable and speculative hypothesis. However, they do claim that changes in skull architecture through processes of social selection were a necessary prerequisite for language evolution. As they write:

> We propose that as a result of paedomorphic morphogenesis of the cranial base and craniofacial morphology *Ar. ramidus* would have not been limited in terms of the mechanical components of speech production as chimpanzees and bonobos are. It is possible that *Ar. ramidus* had vocal capability approximating that of chimpanzees and bonobos, with its idiosyncratic skull morphology not resulting in any significant advances in speech capability. In this sense the anatomical features analysed in this essay would have been exapted in later more voluble species of hominin. However, given the selective advantages of pro-social vocal synchrony, we suggest the species would have developed significantly more complex vocal abilities than chimpanzees and bonobos.[126]

Early *Homo*

Regarding articulation, there is considerable speculation about the language capabilities of early *Homo* (2.5 to 0.8 million years ago). Anatomically, some scholars believe features of bipedalism, which developed in australopithecines around 3.5 million years ago, would have brought changes to the skull, allowing for a more L-shaped vocal tract. The shape of the tract and a larynx positioned relatively low in the neck are necessary prerequisites for many of the sounds humans make, particularly vowels. Other scholars believe that, based on the position of the larynx, not even Neanderthals had the anatomy necessary to produce the full range of sounds modern humans make![127][128] It was earlier proposed that differences between *Homo sapiens* and Neanderthal vocal tracts could be seen in fossils, but the finding that the Neanderthal hyoid bone (see below) was identical to that found in *Homo sapiens* has weakened these theories. Still another view considers the lowering of the larynx as irrelevant to the development of speech.[129]

Archaic *Homo sapiens*

Steven Mithen proposed the term *Hmmmmm* for the pre-linguistic system of communication used by archaic *Homo*. beginning with *Homo ergaster* and reaching the highest sophistication in the Middle Pleistocene with *Homo heidelbergensis* and *Homo neanderthalensis*. *Hmmmmm* is an acronym for *h*olistic (non-compositional), *m*anipulative (utterances are commands or suggestions, not descriptive statements), *m*ulti-*m*odal (acoustic as well as gestural and facial), *m*usical, and *m*imetic.[130]

Homo heidelbergensis

Homo heidelbergensis was a close relative (most probably a migratory descendant) of *Homo ergaster*. Some researchers believe this species to be the first hominin to make controlled vocalizations, possibly mimicking animal vocalizations,[130] and that as *Homo heidelbergensis* developed more sophisticated culture, proceeded from this point and possibly developed an early form of symbolic language.

Homo neanderthalensis

The discovery in 1989 of the (Neanderthal) Kebara 2 hyoid bone suggests that Neanderthals may have been anatomically capable of producing sounds similar to modern humans.[131][132] The hypoglossal nerve, which passes through the hypoglossal canal, controls the movements of the tongue, which may have enabled voicing for size exaggeration (see size exaggeration hypothesis below) or ma reflect speech abilities.[25][133][134][135][136][137]

However, although Neanderthals may have been anatomically able to speak, Richard G. Klein in 2004 doubted that they possessed a fully modern language. He largely bases his doubts on the fossil record of archaic humans and their stone tool kit. For 2 million years following the emergence of *Homo habilis*, the stone tool technology of hominins changed very little. Klein, who has worked extensively on ancient stone tools, describes the crude stone tool kit of archaic humans as impossible to break down into categories based on their function, and reports that Neanderthals seem to have had little concern for the final aesthetic form of their tools. Klein argues that the Neanderthal brain may have not reached the level of complexity required for modern speech, even if the physical apparatus for speech production was well-developed.[138][139] The issue of the Neanderthal's level of cultural and technological sophistication remains a controversial one.

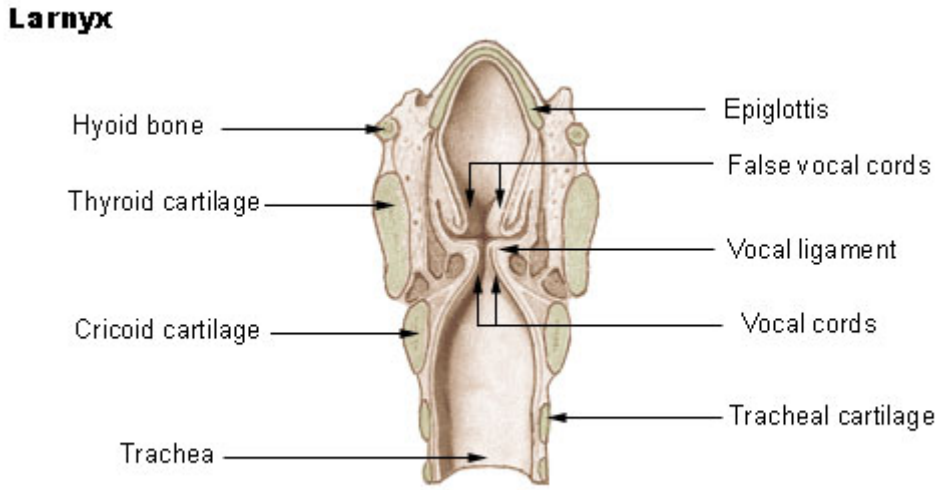
Based on computer simulations used to evaluate that evolution of language that resulted in showing three stages in the evolution of syntax, Neanderthals are thought to have been in stage 2, showing they had something more evolved than protolanguage but not quite as complex as the language of modern humans.[140]

Homo sapiens

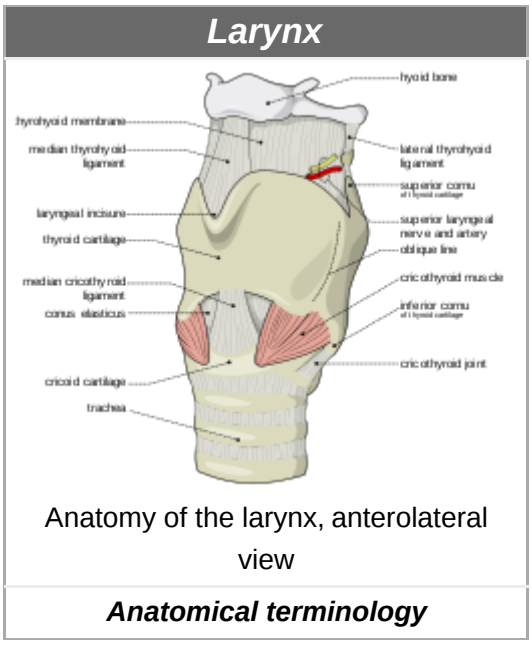
Anatomically modern humans begin to appear in the fossil record in Ethiopia some 200,000 years ago.[141] Although there is still much debate as to whether behavioural modernity emerged in Africa at around the same time, a growing number of archaeologists nowadays invoke the southern African Middle Stone Age use of red ochre pigments—for example at Blombos Cave—as evidence that modern anatomy and behaviour co-evolved.[142] These archaeologists argue strongly that if modern humans at this early stage were using red ochre pigments for ritual and symbolic purposes, they probably had symbolic language as well.[143]

According to the recent African origins hypothesis, from around 60,000 – 50,000 years ago[144] a group of humans left Africa and began migrating to occupy the rest of the world, carrying language and symbolic culture with them.[145]

The descended larynx



The **larynx** or **voice box** is an organ in the neck housing the vocal folds, which are responsible for phonation. In humans, the larynx is *descended*. Our species is not unique in this respect: goats, dogs, pigs and tamarins lower the larynx temporarily, to emit loud calls.[146] Several deer species have a permanently lowered larynx, which may be lowered still further by males during their roaring displays.[147] Lions, jaguars, cheetahs and domestic cats also do this.[148] However, laryngeal descent in nonhumans (according to Philip Lieberman) is not accompanied by descent of the hyoid; hence the tongue remains horizontal in the oral cavity, preventing it from acting as a pharyngeal articulator.[149]



Despite all this, scholars remain divided as to how "special" the human vocal tract really is. It has been shown that the larynx does descend to some extent during development in chimpanzees, followed by hyoidal descent.[150] As against this, Philip Lieberman points out that only humans have evolved permanent and substantial laryngeal descent in association with hyoidal descent, resulting in a curved tongue and two-tube vocal tract with 1:1 proportions. Uniquely in the human case, simple contact between the epiglottis and velum is no longer possible, disrupting the normal mammalian separation of the respiratory and digestive tracts during swallowing. Since this entails substantial costs—increasing the risk of choking while swallowing food—we are forced to ask what benefits might have outweighed those costs. The obvious benefit—so it is claimed—must have been speech. But this idea has been vigorously contested. One objection is that humans are in fact *not* seriously at risk of choking on food: medical statistics indicate that accidents of this kind are extremely rare.[151] Another objection is that in the view of most scholars, speech as we know it emerged relatively late in human evolution, roughly contemporaneously with the emergence of *Homo sapiens*.[32] A development as complex as the reconfiguration of the human vocal tract would have required much more time, implying an early date of origin. This discrepancy in timescales undermines the idea that human vocal flexibility was *initially* driven by selection pressures for speech.

The size exaggeration hypothesis

To lower the larynx is to increase the length of the vocal tract, in turn lowering formant frequencies so that the voice sounds "deeper"—giving an impression of greater size. John Ohala argues that the function of the lowered larynx in humans, especially males, is probably to enhance threat displays rather than speech itself.[152] Ohala points out that if the lowered larynx were an adaptation for speech, we would expect adult human males to be better adapted in this respect than adult females, whose larynx is considerably less low. In fact, females invariably outperform males in verbal tests, falsifying this whole line of reasoning. W. Tecumseh Fitch likewise argues that this was the original selective advantage of laryngeal lowering in our species. Although (according to Fitch) the initial lowering of the larynx in humans had nothing to do with speech, the increased range of possible

formant patterns was subsequently co-opted for speech. Size exaggeration remains the sole function of the extreme laryngeal descent observed in male deer. Consistent with the size exaggeration hypothesis, a second descent of the larynx occurs at puberty in humans, although only in males. In response to the objection that the larynx is descended in human females, Fitch suggests that mothers vocalising to protect their infants would also have benefited from this ability.[153]

Phonemic diversity

In 2011, Quentin Atkinson published a survey of phonemes from 500 different languages as well as language families and compared their phonemic diversity by region, number of speakers and distance from Africa. The survey revealed that African languages had the largest number of phonemes, and Oceania and South America had the smallest number. After allowing for the number of speakers, the phonemic diversity was compared to over 2000 possible origin locations. Atkinson's "best fit" model is that language originated in central and southern Africa between 80,000 and 160,000 years ago. This predates the hypothesized southern coastal peopling of Arabia, India, southeast Asia, and Australia. It would also mean that the origin of language occurred at the same time as the emergence of symbolic culture.[154]

History

In religion and mythology

The search for the origin of language has a long history rooted in mythology. Most mythologies do not credit humans with the invention of language but speak of a divine language predating human language. Mystical languages used to communicate with animals or spirits, such as the language of the birds, are also common, and were of particular interest during the Renaissance.

Vāc is the Hindu goddess of speech, or "speech personified". As Brahman's "sacred utterance", she has a cosmological role as the "Mother of the Vedas". The Aztecs' story maintains that only a man, Coxcox, and a woman, Xochiquetzal, survived a flood, having floated on a piece of bark. They found themselves on land and begat many children who were at first born unable to speak, but subsequently, upon the arrival of a dove, were endowed with language, although each one was given a different speech such that they could not understand one another.[155]

In the Old Testament, the Book of Genesis (11) says that God prevented the Tower of Babel from being completed through a miracle that made its construction workers start speaking different languages. After this, they migrated to other regions, grouped together according to which of the newly created languages they spoke, explaining the origins of languages and nations outside of the fertile crescent.

Historical experiments

History contains a number of anecdotes about people who attempted to discover the origin of language by experiment. The first such tale was told by Herodotus (*Histories* 2.2). He relates that Pharaoh Psammetichus (probably Psammetichus I, 7th century BC) had two children raised by a shepherd, with the instructions that no one should speak to them, but that the shepherd should feed and care for them while listening to determine their first words. When one of the children cried "bekos" with outstretched arms the shepherd concluded that the word was Phrygian, because that was the sound of the Phrygian word for "bread". From this, Psammetichus concluded that the first language was Phrygian. King James V of Scotland is said to have tried a similar experiment; his children were supposed to have spoken Hebrew.[156]

Both the medieval monarch Frederick II and Akbar are said to have tried similar experiments; the children involved in these experiments did not speak. The current situation of Ileaf people also points into this direction.

History of research

Modern linguistics does not begin until the late 18th century, and the Romantic or animist theses of Johann Gottfried Herder and Johann Christoph Adelung remained influential well into the 19th century. The question of language origin seemed inaccessible to methodical approaches, and in 1866 the Linguistic Society of Paris famously banned all discussion of the origin of language, deeming it to be an unanswerable problem. An increasingly systematic approach to historical linguistics developed in the course of the 19th century, reaching its culmination in the Neogrammarian school of Karl Brugmann and others.

However, scholarly interest in the question of the origin of language has only gradually been rekindled from the 1950s on (and then controversially) with ideas such as universal grammar, mass comparison and glottochronology.

The "origin of language" as a subject in its own right emerged from studies in neurolinguistics, psycholinguistics and human evolution. The *Linguistic Bibliography* introduced "Origin of language" as a separate heading in 1988, as a sub-topic of psycholinguistics. Dedicated research institutes of evolutionary linguistics are a recent phenomenon, emerging only in the 1990s.

See also

- Digital infinity
- *Essay on the Origin of Languages*
- Evolutionary psychology of language
- FOXP2 and human evolution
- Language acquisition
- *Man's First Word* (children's book)
- Neurobiological origins of language
- Origin of speech
- Origins of society

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